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CONTENTS.

	PAGE.
Agricultural Census, 1930	185
Artificial Farmyard Manure	187
Tropical Dairy Cattle (concluded)	188
The Oil Palm Industry	189
Dutch Rubber Scheme	193
Tanganyika	193
New Colonial Policy	194
Empire Cotton Growing Corporation	195
Trinidad East Indians	195
Sugar Cane Experiments	196
Tropical World Notes	198
Cotton Notes	200
Standard Indian Cottons	201
Experimental Sugar Factory	202
St. Vincent Dairy	203
Japan's Industry and Trade	203
Kenya Sugar	204
British Guiana	204
Reviews	205
Correspondence	206
Books Received	206
Chemical Notes	207
Sugar Notes	208
Sports	209
The Dutch East Indies	210
College News	210
Trend of the Markets	212

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AGRICULTURAL CENSUS 1930.

THE primary objects of the International Institute of Agriculture since its inception in 1905 have been to collect agricultural statistics and other economic and scientific information relating to agriculture which it has broadcasted by means of publications written in a number of foreign languages. Recently a preliminary statement on the 1930 Agricultural Census and a standard form for the collection of the necessary data have been issued by this Body. When it is considered that out of a total of nearly two hundred countries (including colonies) only thirty-seven have taken Agricultural Censuses in the first twenty-five years of the present century and that these countries' areas only represent a little less than half of the land area and about 30 per cent. of the population of the world, the significance of the proposal by this Body that a World Agricultural Census should be taken in 1930 will be realised and the formidable nature of their task appreciated. The question arises at once as to whether those countries which represent 70 per cent. of the population of the world and which have never taken an Agricultural Census (or at least not within the last twenty-five years) will be willing to co-operate in the suggested scheme, but it is hoped that in the light of the strong arguments given in its favour they will see their way to giving all the assistance needed by the Institute.

When it is believed by some that statistics are the useless playthings of a small community or else a necessary evil to be mishandled and misapplied by all and sundry it makes it all the more difficult to convince the world at large of their vital necessity. There is no doubt that the frequent misuse of statistics has often been enough to condemn them as valueless, but when it is remembered that our economic knowledge does depend to a great extent on securing certain statistical information and that if this material is carefully handled it can render valuable service by suggesting lines of enquiry to the state and by affording data to the agriculturalist and the trader upon which to base their future actions, then there should not be any hesitation on the part of all those concerned to impart as accurately as possible the facts required of them specially as this information may be returned to them in a form that may be of benefit to themselves and to the community. Again, if any judgment on the past state of agriculture is to be formed or any deduction made from the present it is absolutely essential that such data should be available.

The main object of the proposed Agricultural Census which will in effect represent an inventory or enumeration of production, producing areas, livestock, rural labour, agricultural machinery and equipment and other important factors which may influence production of food and raw materials, will be to collect statistics of agricultural production in those countries where hitherto no statistics have been taken, thus completing the world information which is already available. An attempt will also be made to obtain the uniformity and comparability desired between the statistics of countries which already have some system of collection. Such a Census should also help to check annual statistics which are more liable to error than Census Inventories as the former are based mostly on estimates and often on comparisons with the previous years which themselves may be inaccurate. In addition, periodical Censuses, if such were taken in the future, should become, by showing the resources of a country at the time taken, permanent records of the history and facts of an agricultural industry and serve as bases for an adequate system of annual statistics and monthly crop reports.

The objects of the Census have been outlined briefly and it remains now to explain the specific values that may be attached to the regular collection of agricultural statistics. To the taxpayer these may not be of much interest. His interests are mainly concerned with the prices he receives as a producer or that he has to pay as a consumer for food, clothing, fuel, &c., and in the prosperity and purchasing powers of his neighbours. Statistics are the only means, however, by which he may be able to obtain this information and with which he may be able to judge whether he is being dealt with fairly or otherwise. His own welfare naturally depends directly upon the intelligent development and use of his country's natural resources, upon the abundance and quality of the food supply, upon raw materials for manufacture and industry, upon exchange values and the relative prices of various commodities, upon transportation and commerce, all of which are to a great extent bound up with agriculture, livestock and forestry. At the same time all factors of national welfare are greatly influenced by an accurate knowledge of production and consumption through a series of years and upon an accurate and timely knowledge of the present and prospective supply and demand. The only way to obtain this knowledge is to encourage the collection of statistics and this is why most official and private organisations have devised some sort of system for the collection of accurate and dependable statistics to help their leaders to map out a long time programme for systematic improvement and development. It is claimed with reason that statistics are a guide to production, marketing and distributive programmes and that with their help it may be possible to evade years of over and under production combined with low and high prices and to make plans for orderly marketing. They are also a guide to financial activity in that they reveal the capital that may be required to develop new areas; they are an index to purchasing power and therefore to the amount of goods that will have to be manufactured and distributed. Government statistics which are unbiassed in their attitude to trade are a preventive to false rumours and of harmful speculations which thrive on uncertainty and lack of information. Finally statistics help to stabilise prices and price adjustments based on actual figures have become a most important factor in national and international economy.

In the face of the almost overwhelming evidence of the use that could be made of agricultural and other statistics it may be asked why so many countries have yet had so little to do with them. Questions of expense and difficulties with regard to their collection seem to have been the main drawbacks. The Institute has in one way come to the rescue by issuing standard forms which may help to solve some of the problems that are likely to occur in countries where the Census is to be taken. With regard to the expenses the decision is left to the countries themselves and it is hoped that they will not overlook the numerous advantages of a Census before discarding the project on the grounds of expense alone. It is of course vital that all the definitions given in the standard forms should be rigidly observed as a number of irrelevant facts collected on isolated occasions would be valueless. There is bound to be considerable ambiguity in the classification of certain of the information which may be available and enumerators will have to exercise extreme care in sending in the returns. Greater difficulties may be encountered in regions where agriculture is largely a matter of native plot cultivation and here the obvious course will be the collection of maximum information with the minimum of headings. Suggestions have been made that the information in such cases should be restricted to the total area under the crop and the total production of each crop in the Census year and that the total livestock and livestock products (*e.g.* butter, cheese, &c.) should be included under the headings of the standard form. The statistics will of course be collected on a fixed date and in as uniform a manner as will be possible under existing conditions.

The co-operation of all nations will be vital for the success of the enterprise, and this, it is hoped will be forthcoming. Much of the "statistically undeveloped territory lies within the Colonial Empire and it is of importance not only to the particular Colony but to the Empire as a whole that this deficiency should be remedied. The attention of the Governments of the Empire has, therefore, been drawn to the need for co-operating to the fullest extent in the project of a World Agricultural Census." If all Empire Governments should co-operate in the International Census their data would be the basis of an Imperial Census which could be taken periodically in the future and become a very useful addition to Empire Statistics.

ARTIFICIAL FARMYARD MANURE.

AN interesting paper by M. Carbery, Agricultural Chemist, Bengal, and R. S. Finlow, Director of Agriculture, Bengal, on some experiments conducted at the research station at Dacca on the production of artificial farmyard manure appears in the *Agricultural Journal of India*, Vol. XXIII, p. 80.

In India, as in many countries, organic matter is continually being leached from the soil, and, at the same time, intensive and unscientific peasant agriculture is carried on. Moreover, in India, a practice of burning cow-dung for fuel deprives the soil of small amounts of organic matter it might derive from that source. The necessity for an artificial organic manure which can be produced cheaply and with minimum trouble is therefore acute.

With the production of such a manure in view, experiments were commenced in 1914 on the bacterial decomposition of material such as straw, jute, cane trash and bagasse, sisal waste, and sunn-hemp. The experiments showed that in the first stages of decomposition, materials such as sisal waste become highly acid owing to the formation of acetic acid. At later stages, ammonia is liberated from the decomposing protein matter and combines with the acetic acid to form ammonium acetate. When highly fibrous materials such as straw or cane bagasse are used, however, much of the nitrogen is liberated as nitrogen gas and lost. The condition of the final decomposition product thus depends largely on the nature of the initial material. A nitrogenous waste material produces an alkaline, ammoniacal residue, while material with a high percentage of pure cellulose furnishes an acid residue containing little nitrogen but much humic matter. It follows, therefore, that the more complete fertiliser of this type is formed by the decomposition of a whole plant. The leaf, with a relatively high nitrogen content, produces an ammoniacal residue and provides the nitrogenous plant food; the fibrous stem decomposes to form essential humic matter for the soil. In true farmyard manure produced from straw litter, the straw decomposes to humic material while the nitrogen is provided by the urine and dung of the stock.

In green manuring, it was found that the amount of moisture in the soil influenced the beneficial effect of the manure. If green manure is turned in on a water-logged soil in a wet climate, rapid and complete decomposition occurs, and much of the product is lost by volatilization or by leaching. The ideal time for ploughing in green manure is when a moderate amount of moisture is present in the soil.

For the production of artificial farmyard manure, any waste plant material obtainable, weeds, jungle grass, cane trash and bagasse, &c. is collected. In a wet climate, conditions may be moist enough to allow the manure to be made in ground-level heaps, but where dry conditions prevail the heap is placed in a pit to avoid loss of moisture. A pit seems to be generally more satisfactory. Heaps are built up by making a layer of the mixed material about a foot thick and watering it with a solution containing about 0.05 per cent. of nitrogen. The solution is made by dissolving sufficient ammonium sulphate, ammonium acetate, or synthetic urea, in water to give a content of 0.5 per cent. of nitrogen; by diluting cattle urine ten times; or by shaking cattle-dung with twenty times its weight of water. Of these materials, the dilute urine and the cattle-dung appear to give most satisfactory results. About one pound of solution and sufficient water to dampen the material thoroughly are added for every 100 pounds of dry material. The amount of water added is varied according to the climatic conditions prevailing. It is essential to keep the heap moist. A slight sprinkling of ground phosphate, or sodium or ammonium phosphate is added. The liquid should be spread evenly throughout the whole heap, for if this be not done decomposition occurs only in patches. The treatment is continued for each foot-layer until the heap is from seven to nine feet in height. The temperature of the heap rises to above 100°F. Decomposition of the most refractory material is complete in four to five months. A dark powdery product similar to well-rotted cattle dung is obtained.

The following table gives analyses of some manures obtained at the Dacca Station from (1) weeds and litter (2) weeds and trash.

	(1)	(2)
Moisture ..	.. 56.05 %	68.34 %
Loss on ignition	.. 9.19 ,,	—
Nitrogen (dry sample)	.. 1.29 ,,	1.008 ,,
Phosphate (dry sample)	.. 0.64 ,,	0.38 ,,
Potash (dry sample)	.. 0.83 ,,	0.42 ,,

It is emphasised that valuable manure can be made by the smallest farmer who owns a cow. It is only necessary for him to collect his waste material and the urine and dung from his cattle and, with a little care and supervision in the making of his heap, he can produce supplies of fertiliser with little greater cost than that of carting his material. The writer suggest that the method can be applied with advantage on a small scale in the garden when dead leaves, lawn cuttings, and general refuse may be utilised.

The following are analytical data of manure so obtained: *A*. Made from garden refuse with urine, and (or) cow-dung and water, with bone; *B*. Made from garden refuse with a one per cent. solution of ammonium sulphate plus bone:—

	A	*B*
Moisture ..	71.25 %	54.12 %
Phosphate ..	0.26 ,,	0.39 ,,
Nitrogen ..	0.57 ,.	0.68 ,,

H. H. C.

TROPICAL DAIRY CATTLE.

BY

CAPTAIN H. V. METIVIER, O.B.E., B.SC., M.R.C.V.S.

(*Concluded.*)

IN this system of grading up with pure-bred Friesian bulls on highly graded Zebu cattle, the stage has been reached where the three-quarter bred heifers are now calving and figure IX shows animals of such breeding in calf. These heifers are all very well grown, extremely hardy and are averaging about 28 lb. of milk daily a month after calving which is better than the half-bred animals at the same period while their temperaments as dairy cattle are excellent. They have all been reared on the pail and have received the same treatment in being turned out to pasture and then brought in once daily for a small concentrate ration from the time they were yearlings up to a period of six weeks before calving when they have received the same food as dry cows before they calve. Several bulls of this breeding which have grown and matured much earlier than the half-bred bulls are now posted to different districts for service by the Agricultural Department of Trinidad.

As in the case of the half-bred cows and bulls it is intended to select cows and bulls that are three-quarter bred and mate them in order to compare the result of their progeny with the three-quarter bred animals obtained when a pure-bred sire is bred to a half-bred cow.

It will then be possible to compare the results in the following animals :—

(*a*) Half-bred cow (dam a native Zebu cow sire pure-bred Friesian bull).

(*b*) Half-bred cow (progeny of grade Friesian bull (half-bred) and grade (half-bred) cow).

(*c*) Three-quarter bred cow (progeny of either (*a*) or (*b*) and a pure-bred bull).

(*d*) Three-quarter bred cow (progeny of cow and bull of the same breeding as (*c*).

An excellent opportunity is available to compare these results of grading up from many cows but in a certain cow, as all the progeny have been heifers, it will be most interesting to see the results ; a grade Zebu cow, when bred to a pure-bred Friesian bull, produced a heifer Mary I, one of the animals in Figure V. Mary I, when bred to a half-bred Friesian bull produced Mary II, the best grade in type VI, and shewn by herself in figure VIII. Mary I, when bred to " King Butter Girl Walker," (pure-bred bull) calved another heifer Mary III (three-quarter bred) which is now in milk giving very satisfactory results and her calf, whose sire is a pure-bred bull (Royal Duke) is also a heifer seven-eighths bred. It should also be mentioned that Mary II, when bred to a pure-bred bull, also had a heifer calf three-quarter which also belongs to class (*c*) the result of mating a pure-bred Bull to (*b*) class cow ; this heifer has grown extremely well and will soon be ready for breeding purposes. The seven-eighths calves that are now being added to the herd take to the method of hand rearing extremely easily ; the hump, pendulous ears and well developed dew lap have all disappeared (typical of the Zebu) and they can easily be taken for pure-bred stock. A great asset in grading with Friesian stock is that all the progeny are so uniform in their markings ; the first cross is as a rule black and then afterwards the black and white markings appear. A herd therefore looks quite uniform in colour and it only takes a short time to carry this out. With some other breeds Red-polls, Shorthorns and Jerseys, when these animals are bred to highly graded Zebu cattle, there is a tendency for some of the young stock to show a marked striping and they are generally referred to as brindle coloured cattle. It is remarkable that grade Zebus of such breeding and colouring (brindle marked) when bred to pure-bred Friesian bulls throw at once black and white calves, the same markings as three-quarter bred young stock.

This grading up with the Friesian has given such good results so far that the Agricultural Department of Trinidad are now encouraging the local dairymen, who are chiefly East Indians and own one or two cows, to carry out the same system of grading up. These people in many cases have a certain percentage of Friesian blood in their stock as on many of the Government Pastures grade bulls of this breeding have been used for some time now with success. It has been already mentioned that heifers, daughters of such bulls with only twenty-five per cent. Friesian blood, have done quite well as milkers and are a considerable improvement on the ordinary Zebu milch cow.

An opportunity has now occurred to show the result of this system of grading up due to the fact that at weekly demonstrations in clean milk production carried out at the Government Dairy and Stock Farm the East Indians can see these animals, as young stock, as heifers and bulls, as well as cows and heifers in milk. The Medical and Health Department, who are keenly interested in these demonstrations, are more than anxious that the small dairyman should be taught how to make dairying profitable as it is believed that a better type of dairy cow is the chief solution of clean milk in the tropics. The Government are importing young pure-bred Friesian bull calves from Canada at about 9 months of age allowing them to become naturally immunized and then letting them stand for service in different parts of the Colony. Figure X shows young bred stock (4 bull calves, 2 heifer calves) imported from Canada. Considerable attention is also given in this educational work to the handling and feeding of dairy cattle especially the rearing of calves and though the task is a big uphill fight, it can safely be said that as soon as the East Indians and other small dairymen handle grade Friesian cattle for dairying purposes a greater quantity of clean milk will be available in the Colony for consumption.

TROPICAL DAIRY CATTLE

(*The article appears on page* 188)

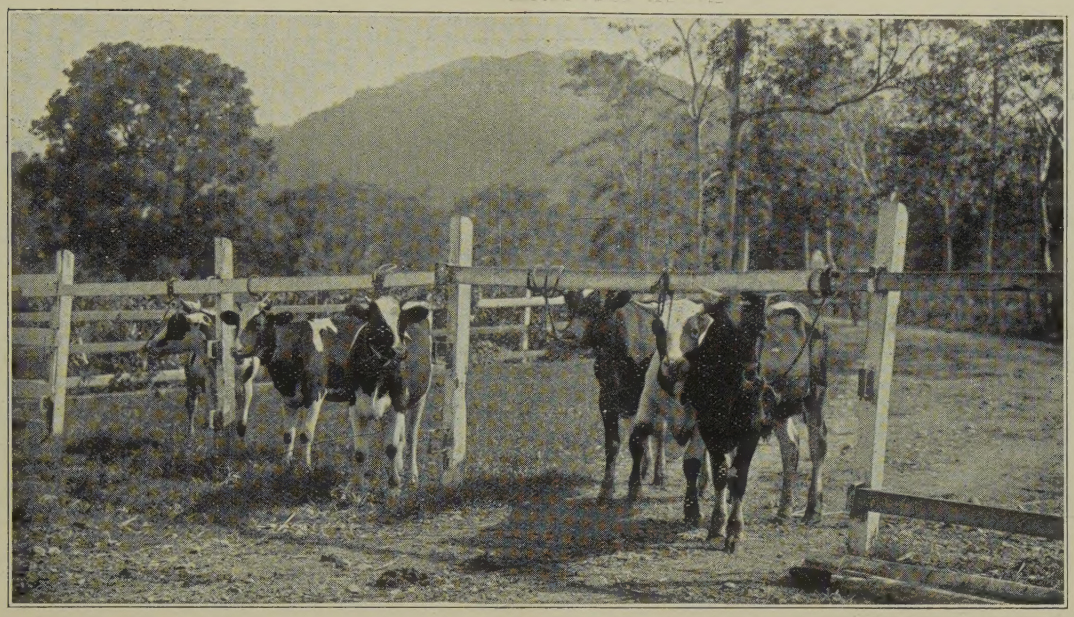


Photo by *Tucker Picture Co.*

FIG. IX.

Grade (Three-quarter Bred) Friesian Heifers.

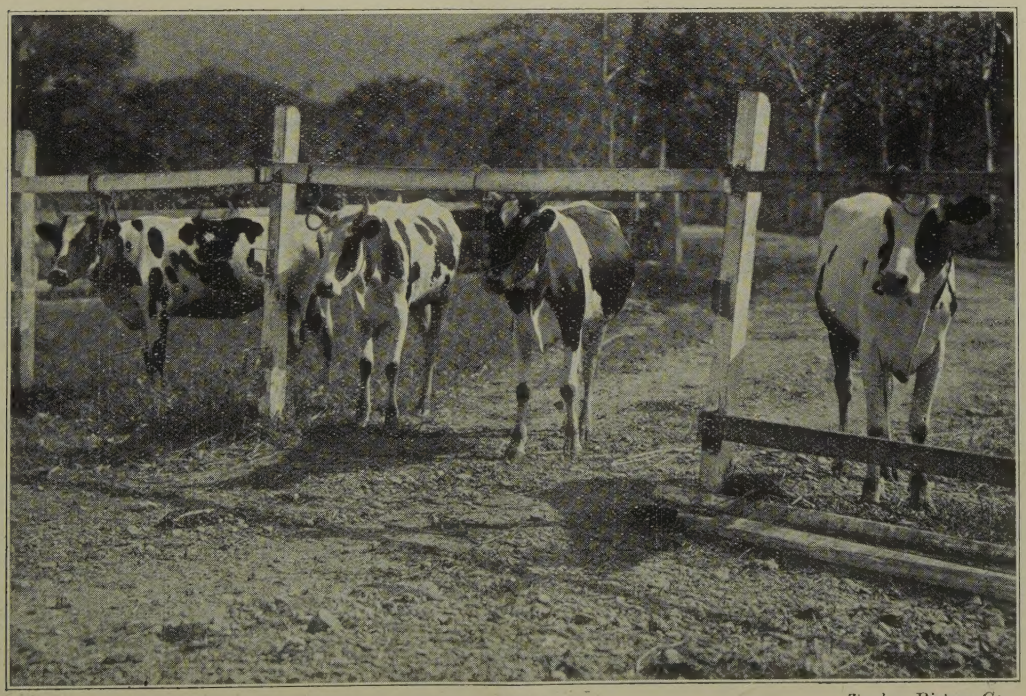


Photo by *Tucker Picture Co.*

FIG. X.

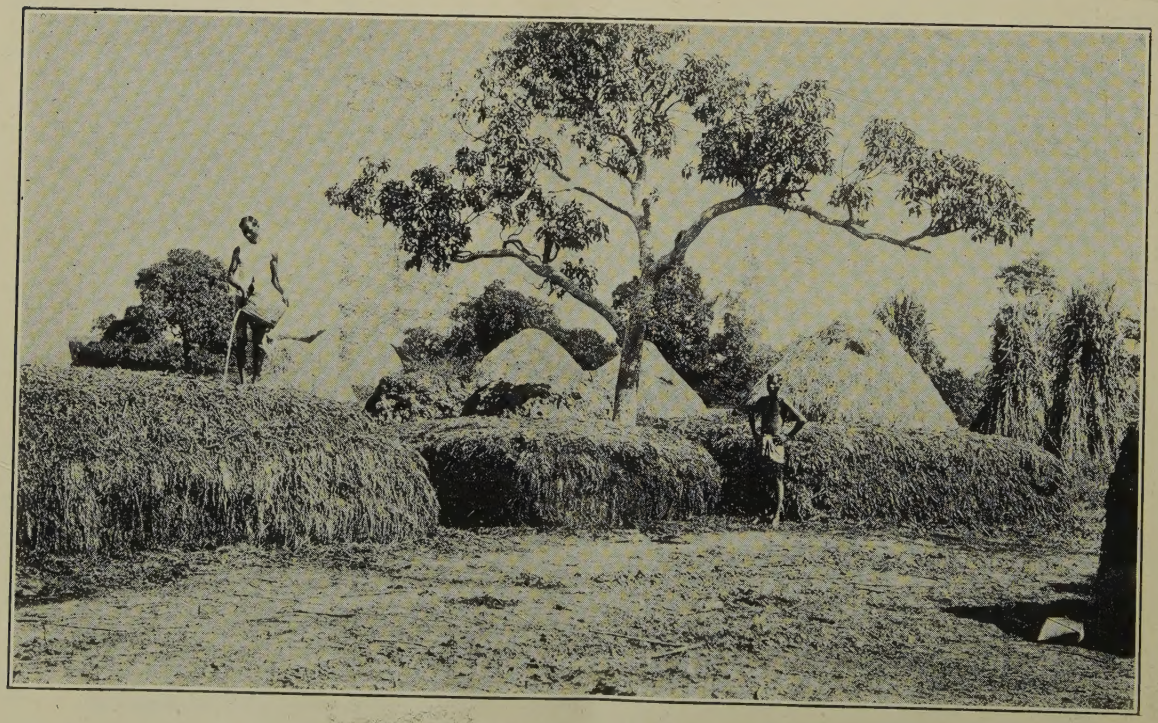
Imported Pure Bred Friesian Bulls and Heifers.

COLLEGE EXPERIMENTAL PLOTS

Photo by *Tucker Picture Co.*

(*See p.* 209.)

ARTIFICIAL FARMYARD MANURE



Artificial Farmyard Manure at Dacca.—(*See p.* 187.)

THE OIL PALM INDUSTRY.

BY F. J. MARTIN, M.A., PH.D. (Cantab.), F.I.C.
Agricultural Chemist-in-charge of the Division of Research Lands and Forests Department, Sierra Leone.

THE oil palm (*Eloeis guineensis*) is the predominant economic tree of the West Coast of Africa and the products of this tree, namely palm oil and palm kernels, have always been one of the mainstays of West African trade. Of more recent years the cult of the oil palm has spread farther afield and the Belgian Congo, negligent of its oil palm produce until a few years ago, now ranks second to Nigeria as the country exporting the greatest amount of oil palm produce. In the East Indies where the oil palm is not indigenous it has now been imported and cultivated on plantation lines, and in Sumatra and Malaya this industry is assuming an important aspect. As may be expected, West Africa views with some alarm this adoption of what is virtually a West African weed as a plantation crop in the East Indies and, with the memory of rubber still fresh, is investigating precautionary measures to avert any threat to the West African trade in oil palm produce.

2. It is of interest to study the present position with respect to the production of palm oil and palm kernels in order to get into proper perspective the probable effect an active programme of oil palm cultivation in the East Indies or the Belgian Congo, would have on the West African oil palm industry. The world's production of palm oil and kernels as shown by the exports of the various producing countries for the year 1925, is given below.

World's Production of Palm Oil and Palm Kernels during 1925.

Country.	*Export of Palm Kernels.*	*Export of Palm Oil.*
	Tons.	*Tons.*
Nigeria ..	272,202	128,332
Gold Coast ..	6,569	1,415
Sierra Leone ..	63,231	2,988
French Guinea ..	10,416	845
Ivory Coast ..	13,989	8,037
Dahomey ..	43,944	16,616
Cameroons ..	35,849	6,176
Togoland ..	8,677	2,623
Belgian Congo ..	71,885	16,417
Sumatra ..	1,202	6,905
Malaya ..	110	536
Liberia and French Congo	?	(Not known but not more than few hundred tons).
Total World's Production ..	528,074	190,890

3. Of the palm kernels 65 per cent. is exported from British West African Colonies, 21 per cent. from French West African Colonies and 14 per cent. from the Belgian Congo, while the amount of kernels produced in the East Indies is at present negligible.

4. The only menace to West African kernels appears therefore to come from the Belgian Congo and the rapid development in this latter Colony is as interesting as it is amazing. Prior to 1912, there was no oil palm industry in the Belgian Congo with the exception of a small export from the Mayumbe District and this small area, bordering the sea at the mouth of the Congo, only exported annually about 2,000 tons of oil and about 3,000 to 4,000 tons of kernels. With the advent of the "Huileries du Congo belge" whose primary object was the development of the palm oil industry, the trading side of the Company, originally ancilliary to the development side, commenced the buying of kernels in the interior of the Congo, the money so obtained by the natives being used to purchase stores from the Company. This side of the business developed so rapidly that a subsidiary company was formed to deal with this aspect only. Other companies took up the purchase of kernels in the Belgian Congo and now there are buying centres all over the colony. Of the 70,000 tons of kernels now exported annually, about 4,000 tons are supplied by the old industry in the Mayumbe District, some 5,000 tons by the various palm oil factories belonging to the "Huileries du Congo Belge" and the rest, 60,000 tons, is a result of a new industry in the interior of the colony which has sprung up since 1912, and is still increasing.

5. But this, unfortunately for the West Coast, is not the only menace to the palm kernel industry and here again it is the East Indies that provides the menace. It does not appear probable that the kernel production of the oil palm plantations of Sumatra and Malaya will ever be a very serious menace to West Africa, since the percentage of kernels in the "deli" oil palm (the type there cultivated) is very small, but the ever increasing production of copra, especially in Malaya, is bound to affect adversely the trade in palm kernels. Copra yields oil which although not identical with palm kernel oil has very similar properties, and these two oils are very often interchangeable in manufacturing processes. The point that governs the use of one in preference to the other is generally the price and the respective values vary in accordance with the supplies available. Since 1900 the world's annual supply of copra has increased from less than 200,000 tons to over 600,000 tons and in the Straits Settlements alone the increase was from 28,214 tons in 1900 to 169,800 tons in 1922, a truly amazing development. This increasing supply of a product which can be used as a substitute for palm kernels will adversely affect the palm kernel industry unless increasing markets can be found for both commodities.

6. With regard to palm oil the situation is somewhat different and although the present exports from the east are still comparatively

small they provide the cloud, at present "no bigger than a man's hand," which threatens West Africa. The British West African Colonies, chiefly Nigeria, produce about 67 per cent. of the world's supply. The French West African Colonies about 18 per cent. the Belgian Congo about 9 per cent. while the East Indies export rather less than 4 per cent. of the world's supply. Where therefore comes the menace of Sumatra and the Belgian Congo to West Africa generally? And how are the British West African Colonies particularly affected by developments in these areas and in those of French West African Colonies? In order to understand the magnitude of the menace it is essential to study the conditions of development and possible expansion in the West African Colonies, the Belgian Congo and in the East.

7. *The oil palm in West Africa.*—As shown above, practically the whole of the world's oil palm produce comes from the West African Colonies, chiefly from Nigeria. The palmeries, the land on which the palms stand, the collection of fruit and the extraction of the oil and kernels are all in the hands of the natives. The extraction of oil is carried out by crude native, small-scale methods in which more than half the oil is never recovered and the quality of the oil is generally low (that is to say the free fatty acids of the oil are usually high). The oil is collected in four-gallon petrol tins and carried by head to the nearest buying centre and it is no exaggeration to say that practically all the palm oil produced on the West Coast is produced by natives on the small scale process and carried by head into buying centres in driblets for sale. The collection and export of oil is generally in the hands of European firms, although there are often small native firms which assist in the initial stages of collection.

8. *British West Africa.*—In all the British West African Colonies means are being considered of increasing the oil palm produce, and improving the quality of oil in order to enable it to compete with oil from plantation sources. The problem differs according to the conditions in the various colonies. In Nigeria where there is an enormous reserve of natural palmeries, especially in the south, the view taken is that the natural palmeries should be exploited. At present the fruit is collected and extracted by the natives and only the final products, oil and kernels sold, and, as mentioned above, probably more than half the oil is never recovered. Seeing that about 128,000 tons are exported annually and there is a considerable local consumption this means that over 150,000 tons of oil, probably much more, is lost every year by inadequate methods of extraction. In order to avoid this loss it has been suggested that factories should be erected in suitable areas and that every encouragement should be given by government—possibly including financial assistance in the initial stages of the venture—to enable private enterprise to establish factories. These factories would have a profound effect on native life; the natives would be more or less limited to the tending of the trees and the collection of fruit and the home industry of oil extraction, now practised in every native hut in West Africa where palms exist, would be abolished or at any rate seriously curtailed, in those areas affected by factories. It is possible to demonstrate that the native would be better off financially by a change to new and efficient methods of extraction, but it is very difficult to convince him that this is so, and the one or two pioneer factories at present established in Nigeria find it very difficult to purchase sufficient fruit in spite of the fact that they are ready to pay as much for the fruit as the native can obtain for the amount of oil and kernels which he extracts from the fruit by native methods. The manufacturing side of the question does not appear to present any insuperable obstacles but the difficulties of arranging for concessions of a suitable magnitude without interference with native rights and customs have so far prevented exploitation.

9. In that part of the Cameroons, once German, now administered by Britain, a totally different state of affairs exists. Here plantations were established before the war and it is estimated that some 15,000 acres of plantation are, or will in the near future be, in bearing. Factories of several different types of up-to-date machinery have been erected to deal with the produce of these estates; they include such different types as the Solvent process, the Hydraulic press process and the Digester-Centrifugal process, and of these Mr. A. C. Barnes (late Agricultural Chemist, Nigeria) who recently visited these factories and saw them all in working, prefers the Digester-Centrifugal process. No attempt has apparently been made to grow a special type of oil palm and the average oil content is similar to that in Nigeria, *i.e.*: approximately 20 per cent. The Cameroons should therefore develop an industry in palm oil of good quality.

10. In the Gold Coast the oil palm industry is swamped by the magnitude of the cocoa industry and exports of palm produce are very small. Here it is held that demonstration plots, showing improvement in yield when the natural palmeries are carefully tended, are of assistance in encouraging increased production, while it has been suggested that a model plantation, of say 1,000 acres of different varieties of oil palm, including the Deli type from Sumatra, would also assist in showing the natives the possibilities of cultivating oil palm.

11. In Sierra Leone the problem assumes another aspect. The fruit in Nigeria is comparatively rich in oil, say 20 per cent. oil to fruit, but in Sierra Leone the most common variety has only about half this amount of oil. Moreover the palmeries do not appear to be so thickly concentrated as in Nigeria. Under these circumstances it does not appear that the natural palmeries could be so successfully exploited by factories as in Nigeria, and the view taken is that it is necessary first to establish suitable plantations to serve as centres of supply

before erecting oil mills. The Government is therefore establishing a plantation of some 2,000 acres in extent consisting of the best local varieties and the best imported varieties from Nigeria and Sumatra. This plantation will serve as a demonstration of the possibilities of oil palm cultivation and also as a seed supply for future development.

12. *French West Africa.*—As will be seen from the table of oil palm exports French West Africa exports about one-fifth of the world's oil palm produce and efforts are being made to increase these exports from French colonies. The efforts made to increase production in French West Africa were briefly described by Monsieur le Gouverneur-General Carde at the opening of the "Conseil du Gouvernment" of French West Africa held at Dakar in December, 1927, and the following is a translation from his speech :—

> "Studies patiently followed since 1921, first solely by the aid of the funds of the general budget and since 1925 with the assistance of the "Consortiun des Oleagineux" now give definite results. The first classification of oil palms of the Ivory Coast was worked out by 1925; the determination of the oil palms of Dahomey suffered a set back due to the lack of technical staff but is now finished; 38 types of oil palms at Pobé selected from many hundreds, were thereafter isolated and grouped by categories with the object of self-fertilisation or hybridisation. Now the Dahomean cultivator, already very advanced, seeks the advice of the agricultural department for the amelioration of his palmeries and reconstructs or extends these with the aid of plants which he demands from the Station at Pobé. In the Ivory Coast from the point of view of plantations the results are still better. The native has so well understood that it is all to his interest to plant only oil palms fully guaranteed from the point of view of yield, that the station at La Mé can no longer supply the demand for plants and is obliged to give selected seeds of which the operator must have assured himself of the germination and parentage. It is therefore by the tens of thousands that these seeds are given away. For those who know the instinctive opposition of the peasant in general, and of the African in particular, to all that which is not hallowed by tradition these results are most encouraging: henceforth the native has confidence in our methods and production will be affected by this.
>
> In the stations of La Mé and Pobé the research on covering plants has resulted in the determination of those most favourable for the maintenance of the palmeries, and has shown the value of the cultivation between the palms of plants giving crops of high value such as coffee and cocoa. Finally it has been possible to draw up at the Station of La Mé reliable figures calculated in "work days" of different methods of establishing plantations.
>
> The efforts to popularise an oil-extracting plant, simple yet solid, was mentioned last year. They have given results which we were right to expect; thus the inhabitants of Dabou have formed an association having for its object the purchase of communal oil presses, and those of the district of Lahou, so rich in palmeries, are following along the same lines."

13. The mechanism referred to for the improved production of palm oil appears to be an adaptation of the Simon cider press and it is claimed that this machine extracts a higher percentage of oil than is obtained by the native methods and that the free fatty acid content of the oil is low.

14. *The Belgian Congo.*—Reference has been made in a previous paragraph to the rapid increase in the palm kernel industry in this country but the production of palm oil is on an entirely different footing. Except for the coastal district of Mayumbe, whose exports may be reckoned at about 2,000 tons of palm oil a year, the exploitation of palm oil appears to be in the hands of one company, the "Huileries du Congo Belge"; and this company has been given certain concessions involving large areas, some 750,000 hectares in all (or nearly two million acres). They have erected a number of mills and their annual export has reached some 10,000-11,000 tons of palm oil of good quality (free fatty acids from 5 to 6 per cent.). As this company is continuing to erect more mills, the export of oil from this source may be expected to increase and there seems every possibility that this industry, developed during the last fifteen years, will within the next few years produce double the present amount. The oil produced by this company is of a very high quality with a low free fatty acid content. In addition to exploiting the natural palmeries of the Belgian Congo some 5,000 acres of plantation palms have been planted and are now coming into bearing, while in some cases the natural palmeries have been brought under cultivation. Increased yields are obtained from these "palmeries amenagées," of which there exists a considerable area.

15. *The East Indies.*—In the East Indies attention has been focussed on Sumatra in view of the very systematic manner in which the West African oil palm has been adopted as a plantation crop. Less attention has been paid to Malaya but the possibilities of this colony must not be overlooked; already (*Tropical Life*, April, 1927, p. 58) in the Federated Malay States there are 12,500 acres under oil palm plantations while on those estates already planted to oil palms another 22,000 acres is available when wanted. Further areas totalling 118,800 acres have been earmarked as probably suitable for oil palm cultivation, so that should the oil palm prove a lucrative crop in the Federated

Malay States over 150,000 acres of land are probably readily available for its cultivation on plantation lines.

16. In Sumatra the oil palm industry has progressed further than in the Federated Malay States and over 60,000 acres had been put down to oil palm plantation by the end of 1925, while along the West Coast of Sumatra concessions involving some 200,000 acres of land have been obtained by certain companies with a view to the possible development of the oil palm industry. (Auchinleck Bull. No. 8, Agricultural Department, Gold Coast, p. 11.)

17. The problem of establishing an oil palm industry has been tackled scientifically and systematically by the Dutch and they have been singularly fortunate in that the parent palms introduced into the East Indies were of an extremely good type. This type, known as the Deli type, has large fruit and yields a high percentage of oil, while careful selection over a long period has resulted in producing a strain having a high yield of good quality fruit.

18. In dealing with the fruit the Dutch appear to have developed the hydraulic press as a means of extracting the oil, and the fruit, after being subjected to one or two pressings, is sometimes further extracted with benzene. The oil so obtained, with the possible exception of the benzene extract, is of a high quality and factories in the East are able to turn out oil in which the free fatty acids do not exceed 3 per cent. With a guarantee of a standard quality of oil it is possible to market the oil from Sumatra under more advantageous conditions than the native product from West Africa and this will tell strongly in favour of the East Indian oil should it ever be produced in quantities sufficiently large to challenge the West African palm oil industry.

19. *Yields of fruit.*—In Sumatra very careful records have been kept of the yields but there is apparently a great deal of difference of opinion as to what constitutes a probable yield from an oil palm plantation in Sumatra. The estimated yields given by Dr. Rutgers in 1922 were as follows:—

Age of plantation.	*Yield as pericarp oil (90 per cent. recovery). Pounds per acre.*
4th year ..	702
5th do. ..	1,404
8-10th do. ..	1,579
11-20th do. ..	2,086
21-30th do. ..	2,086
over 30th do. ..	1,230

20. These figures are criticised by M. Ives Henry (Director of Agriculture, French Indo-China) and the following figures of actual yields taken from M. Henry's graphs were given by Messrs. Auchinleck and Waters at the First West African Agricultural Conference (1927).

Age.	*Pericarp oil pounds per acre.*
5 years. ..	260
6 do. ..	441
7 do. ..	682
8 do. ..	962
9 do. ..	1,130
10 do. ..	1,083
11 do. ..	927

(The yields for Malaya were said to be rather higher than these.)

21. There is an enormous discrepancy between these two sets of figures but as a result of their investigations in Sumatra, Messrs. Auchinleck and Waters stated at the West African Conference that they regarded 15 cwts of pericarp oil per acre as a future probable yield for plantation palms in full bearing in the East Indies (*See* also Auchinleck, *loc. cit.* pp. 23 *et seq.*) This estimate indicates a very high yield and these possibilities of high yields and good quality fruit have been brought about by the patient research of the somewhat considerable scientific staff employed by the Dutch in Sumatra.

22. Is the West African oil palm industry menaced by the East Indies and the Belgian Congo? At the West African Agricultural Conference Messrs. Auchinleck and Waters stated that if the present rate of progress in oil palm development is maintained in Sumatra over 400,000 acres of land will be in cultivation by 1940. A very simple arithmetical calculation will show that at even at 10 cwts. an acre (two thirds of their estimate) this area of land is capable of producing more palm oil than is at present exported by all the palm oil producing countries of the world.

23. The local consumption of palm oil in West Africa is enormous and is so firmly established that there is little danger of the natural palmeries not being utilised for local food purposes, but there is a distinct possibility that if the East Indies and the Belgian Congo push forward vigorously the development of the oil palm, and produce in sufficient quantities to challenge the West African supply, then the West African export trade will be seriously threatened. The loss of this trade would be a serious thing for certain West African colonies. There is now a marked tendency for buyers of palm oil in England, and more especially in the United States of America, to demand a higher standard quality of oil and these demands are not likely to be adequately met by an unorganised and inefficient native industry. It does not follow that a plantation industry will necessarily oust a peasant industry, it has not done so in the case of copra and cocoa, but these are products which do not require or involve intricate methods of preparation. Quinine, sugar and rubber are instances of industries which with the memory of the present generation have been completely absorbed into organised plantation industries.

24. Whether West Africa will be able with the aid of factories to exploit the enormous existing natural palmeries such as those in the south of Nigeria, or whether they will be able to establish new plantations of good varieties in other parts of the coast where good natural palmeries are not now existent, is a matter for the future to show. The climate and soil are suitable in many parts of the coast, but the conservatism of the natives and the difficulties of arranging concessions of a suitable magnitude to attract private enterprise without disturbing native land rights and customs are the chief obstacles in the way.

25. In conclusion, the writer wishes to express his indebtedness to Mr. F. Montague Dykes for permission to use information supplied about the Belgian Congo and to the Honourable the Commissioner of Lands and Forests, Sierra Leone, for permission to make use of information accumulated in his office files.

DUTCH RUBBER SCHEME.

A RUBBER valorisation scheme has recently been put forward by a Dutch banker, Mr. Kloppenburg. The formation of a valorisation fund and the utilisation of rubber for street paving to develop, by this means, the possibility of a larger consumption and demand for rubber are its main objects. A bank is to be created with a capital of £1¼ million divided into 12,500 shares of £100 each of which 10,000 are to be taken by the rubber producers and as much as have not been taken by the producers, by the public.

The bank's function will primarily be the regulation of prices by eliminating over production from the market and this is to be achieved by taking over any surplus production as soon as the market price drops below 1s. per lb. and to release any accumulated surplus when the market price rises above 2s. per lb. The bank will also have to supply 75 per cent. of the stock purchased at the fixed price of 1s. to the Dutch and British Governments for the purpose of street paving. It is believed that if both Governments use large quantities of rubber for this purpose they might help considerably in stabilizing rubber prices which it is hoped will be kept by this means at between 1s. 3*d*. and 1s. 6*d*. In order to attain such stabilization, however, Dutch as well as British production is to be restricted by about 15 per cent.

The plan has only recently been submitted to the consideration of the London Growers' Association and the International Association for Rubber Cultivation, and it is too early yet to express any opinions as to the suggestions which it carries to solve the present rubber crisis.

TANGANYIKA.

New Agricultural Industries.

New agricultural industries, or industries in new regions, recently begun in the Tanganyika Territory by non-native planters, have to do with the following products :—

Tea in the Eastern Usambaras.

Tobacco (Turkish and Virginian) in the Iringa Province.

Coffee in the high rainfall areas of the Iringa Province.

Bacon and ham in the Iringa Province (a factory is being erected).

The tea in the Eastern Usambaras has been planted on a commercial scale by one planter only up to the present, Capt. M. F. Bell, of Ambalungu Estate, Korogwe, who after twenty years of experience in Ceylon, initiated the tea industry in Kenya for Messrs. Brooke, Bond and Company, and selected the Eastern Usambaras as the most promising situation in East Africa for tea-growing on his own account. His example is spreading to others, and the industry is likely to be a very successful one. Tobacco in the Iringa Province is purely experimental as yet though the prospects for Turkish tobacco are regarded as good. Coffee in the Iringa Province is problematical (except in the Rungwe district) because of the high altitudes at which it is being planted 5,500 to over 6,000 feet, it is likely that the cold will check the production sufficiently to bring it below commercial value. (Capt. Bell has been invited to examine this area on behalf of the Government for its suitability for tea.) All the facilities for successful production of bacon and ham in the Iringa Province exist except possibly sufficiently cheap transport, though this may be overcome should the factory operate its own transport. (It is interesting to note that Major Stuart Wells, former Senior Commissioner at Tukuyu, and now growing coffee there, transports his own coffee crop to Dodoma, a distance of approximately 450 miles; and is able to put his crop on the London market at a total cost of production and marketing of £23 per ton, according to his own figures.)—(*By the courtesy of the Director, Department of Agriculture, Tanganyika.*)

OIL-YIELDING GRASSES IN CEYLON.

INVESTIGATIONS have been made by the Department of Agriculture, Ceylon, of the oils of grasses, thought to resemble citronella, found in large areas in the Eastern Province of the island. These oils are not wholly satisfactory and it is certain that true citronella does not occur in this locality. Trials were begun two years ago with growing citronella in the Wewagam Pattu of this Province and growth has been very satisfactory. A small distillery is now being erected for the distillation of the oil.—(*Perfumery and Essential Oil Record*, Vol. XIX, No. 4.)

NEW COLONIAL POLICY.

THE NEW COLONIAL POLICY, Helmer Key, PH.D., Methuen & Co., pp. viii+214. Price 7*s*. 6*d*.

The title of the book seems to suggest an interpretation of a new movement or a formulation of a desirable policy, but the contents are rather periodic reflections on European economic disorder, the increasing importance of the tropics and the problems facing those countries which have no external areas of expansion. By colonies, it should be noted that Mr. Key includes all areas outside the mother country. The book, although necessarily disjointed, being a collection of newspaper articles, makes entertaining reading and is full of interesting and up-to-date information. The author regards emigration as the solution of present day economic troubles—pressure of population is reduced and new markets created. Owing to lack of areas of expansion and to present day immigration restrictions, some countries are in a difficult position. Amongst these Japan, Germany and Italy are singled out for attention. The economic development of Japan has been rapid, particularly on the industrial side, but it lacks iron ore, coal and petroleum. This circumstance explains why control is sought over Sachalin, and a firm footing wanted on Manchuria and Eastern Mongolia. Japan's *rapprochement* to Soviet Russia cannot be explained on any other ground than that Japan cannot give way in Manchuria where it possesses iron ore and coal mines. There is much bitterness against the white races for their attitude to Japanese expansion. Mr. Kanakami writes "It is obvious that the Great Powers of the West have accumulated more land than they should rightly own—than they can hold without doing injustice to the smaller nations, which find themselves in a sad plight, due to the impossibility of finding room for their surplus population. The injustice . . . would not be so obvious if they were to recognise . . . the principle of unhindered immigration and of unrestricted enterprise within these territories." To find some solution to their difficulties the Japanese have negotiated for concessions in Mexico, Chile, Peru and other countries, but their success has been hitherto slight; it is said, however, that a firm footing has been secured in Brazil where there are flourishing block-settlements in the Sao Paulo hinterland.

The difficulties encountered by the Italian Government in finding room for surplus population become greater every year Mussolini is stated to have said "According as our population increases there are three outlets; to condemn ourselves to voluntary sterility—and Italians are too intelligent for that; to wage war; or to place our surplus population elsewhere." Their colonies on the North African coast have not hitherto been able to absorb a large number of colonists, and the colonies on the East Coast of Africa, Eritrea, Somaliland and Jubaland are for the present only suitable for capitalistic colonisation. Attempts have been made to assist and extend expansion, Mussolini in 1921 founded an Institute for Colonial Enterprise in the shape of a limited liability company of which the capital is subscribed by shipping companies, banks and other interests. A good deal of attention has been paid to the Argentine and Brazil. The Compania Italio Argentina de Colonizacion, founded in 1924, began successfully; five thousand hectares of land were purchased in the Rio Negro valley and in the first half year 1,300 hectares colonised, lots being of 5-15 hectares. An enterprise of greater dimensions is being planned for Brazil and is to be financed with American capital. In general Mr. Key states, "Italy seeks to maintain that it is a proletarian nation which has come too late to market to share in the wealth of the world. The present distribution of that wealth is an injustice which Italy insists on rectifying."

Germany no longer possess any colonies but the problem of expansion is not absent. The president of the Reichsbank has suggested the foundation of Chartered Companies. Such a scheme needs suitable areas, willing emigrants, and sufficient capital, but the proposer is optimistic. The Government has undertaken to compensate colonial undertakings which lost their possessions as a result of the war, but loans are only granted where the undertaking re-purchases the colonial property expropriated. At present investigations are in progress in many places to discover where German colonies in the form of block settlements can be established, and there are great possibilities both in Mexico and in most of the Latin States of South and Central America. The Germans appear to be principally interested in the Argentine, Peru, and Chile which were visited in 1926 by Dr. Luther for the purpose of study.

The book incorporates material published as articles in the *Svenska Dagbladet* and is intended as a continuation of an earlier work entitled "European Bankruptcy and Emigration." To the reviewer, the main interest rises from presentation of many interesting facts which the author's close acquaintance with modern politico-economic writings and movements enables him to give. With regard to his thesis—emigration as a means of solution of European economic problems—it might be pointed out that the bulk of unemployment in Europe is among the industrial classes who make but indifferent agricultural workers, a class needed in the main in the less developed parts of the world.

G. W.

CUBAN SUGAR CROP.

ACCORDING to a Government report issued on 11th June, Cuba's sugar crop for the season just ended amounted to 27,649,988 bags of 325 lb. each. Owing to over production 80,758 bags go under the control of the National Sugar Commission.—(*The Financial News.*)

EMPIRE COTTON GROWING CORPORATION.

EMPIRE COTTON GROWING CORPORATION. Reports received from Experimental Stations, 1926-27.

This, the third annual volume of Reports which the Corporation have issued, is welcome and can be recommended for careful perusal by all those engaged in work on the Cotton crop. The general impression that the volume gives is the similarity in general principle of the problems before the experimenters, whether in Australia, Fiji, or Africa, coupled at the same time with an amazing variety in the actual details of the methods employed in their solution.

The value of the work to the credit of the Corporation during the first five years has lately been under consideration; the matter was indeed referred to in a recent number of this journal, when the view was expressed that much of the preliminary work had been done, and that the Corporation were now in a position to elaborate definite schemes for the extension of cotton growing in the Empire. That this is so, is clear from more than one of the reports of their officers. The report of the Biloela Station in Queensland opens with a brief description of the development of the station, and the provision of extra accommodation for both staff and produce. The Barberton Station report opens in much the same way, and refers to proposals made for expanding the work, enlarging the station on a more permanent basis, and providing for proper laboratory accommodation. Similar remarks are true of the Candover Station in Natal, the Gatooma Station in Southern Rhodesia, and the Shambat Station in the Sudan, where a laboratory, office, gin room and baling room were all added to the equipment during the year. These may seem trivial details, but they are important as showing that the Corporation is in earnest and is really determined on progress in its various spheres of activity, and at the same time they are evidence that much of the preliminary study in deciding on sites for stations and lines of work has now been done, and that the efforts of the Corporation's officers may be expected to become year by year increasingly effective.

In such a volume it is difficult to select any special point of interest for note in a short review. The numbers and variety of insect pests are considerable, as is to be expected with the widespread introduction of a new crop into areas where it had not previously been grown. In Australia, the Corn Ear Worm (*Heliothis obsoleta*) is the serious Bollworm; in South Africa, the Sudan or Red Bollworm (*Diparopsis Castanea*); Fiji suffers, but not severely from the Pink Bollworm (*Platyedra gossypiella*). Jassid is mentioned in more than one report: at Barberton, Parnell describes the successful production of the first Jassid-proof strains which have been selected, and which have now been sent out for trial through the low-country cotton-growing areas of South Africa. Seed selection is the most important line of work, indeed, at all stations, and every station officer reporting devotes attention to recording the progress that has been made. In Queensland, the first distribution of selected station bred seed was made—that this is of good quality may be gauged by the photograph of a plot which yielded 1,708 lb. an acre! At other stations, selection work has either not proceeded so far, or the issue of such seed does not lie within the Corporation's duties.

A very great deal of most careful experimental work is, in short, being done at these stations, which can barely be mentioned. Rotation experiments, designed to get cotton fixed as one of the standard crops of the district, cultivation experiments, of most importance perhaps in Australia where labour is scarce and expensive; entomological work of the first importance by the two Cotton Entomologists of Australia and Nyasaland; the disinfection of seed; as well as general investigations into the possibilities of new cotton growing areas.

The temptation to lapse into local names and measures has in the main been avoided: we note Maicuna and Lubia Beans in Nigeria, but the Sudan Report is largely rendered unintelligible by the adoption throughout of local measures and weights, a most exasperating practice, which is indefensible.

A special word of praise must be accorded to the illustrations, the photographs of the Barberton cottons being of a very high standard.

R. C. W.

TRINIDAD EAST INDIANS.

A REPORT issued by the Trinidad Immigration Department (Council Paper No. 45. Price 4*d*.) states that 897 out of a total estimated population of 127,326 East Indians left for Calcutta in 1927 while there were 78 arrivals. Of the departures 63 per cent. were *bona fide* labourers, 28 per cent. destitutes and 9 per cent. proprietors, cane farmers, &c. The payments towards the cost of immigration which exclude Administration expenses amounted to £23,636 while the Planters' Immigration Fund yielded £28,177 leaving a balance in the hands of the Treasury of £4,541. Amongst their other numerous activities East Indians own 9/10th of the dairies and of the motor buses of the Island, while they occupy 99,783 acres of land of which over 50 per cent. is under cocoa and 12 per cent. under rice. The total value of their savings at the end of the year amounted to £180,604, of which £80,083 was deposited in 1927 in the Government Savings Bank. The total sugar made during 1927 by 19,385 East and West Indian farmers amounted to 51,982 tons as against 73,561 tons last year, while the receipts for canes realised $915,296 as against $1,102,338 in 1926.

SUGAR-CANE EXPERIMENTS.

In 1923-24, a limited amount of land became available for sugar-cane, in the College Estate, and it was decided to make a comparison of a number of the best canes available locally. Some of these were planted in the late autumn of 1923, others in the spring of 1924. The following account of the situation of the plots and the methods of planting is taken from Mr. Dash's report on the first year's working (*Trop. Ag.* II, p. 122) the second year's figures are printed in Vol. III, p. 154.

"The soil of this field is very similar in type to that of the field in which the cultivation experiments described in the last number of this Journal (Vol. II, p. 95) had been carried out—a light to medium silty loam, which works easily when sufficiently moist, but as the particles are very fine there is a tendency to pack and become very hard when dry. It therefore will require to be liberally fed with organic matter. Being savannah land when taken up, the grass roots had first to be exposed; animals for ploughing not being available, it was hand forked and turned over at the beginning of the rainy season, afterwards ridged and furrowed. In July, Bengal beans (*Stizolobium*) were planted on the ridges as a cover crop, which in October was pulled off and placed in the furrows, farmyard manure at the rate of ten tons per acre being applied on this material and the banks broken to cover it. The fall planted cuttings were inserted in the drills, which now occupied the space of the original banks, during early November 1923; distance of planting 5 feet between the rows and 4 feet in the rows. Four varieties, occupying one-eleventh of an acre each, were used—B.H.10 (12), Ba. 6032, H.?, and Badilla. H.? is a seedling from Hawaii, the number of which appears to have been lost. Little trouble was experienced with weeds on account of the heavy smother provided by the Bengal bean crop, and as soon as the canes had made sufficient growth the banks were cultivated and soil thrown to the stools to gradually level up the drills. In the case of the spring planted plots, the procedure had to be somewhat different. Instead of turning in the Bengal beans, they were pulled off and used as a compost heap; this part of the field was then planted in November, 1923, in sweet potato plots after the banks had been lightly forked. The potatoes were dug towards the end of March, 1924, the drills forked and farm manure applied at the rate of ten tons per acre, the old banks being broken to cover it thus making fresh drills in which the cuttings (obtained from a nursery) were inserted during the middle of May. Cultivation thereafter was the same as for the previously mentioned plots, soil from the banks being gradually thrown to the stools to level up the drills. The varieties which occupied one-third of an acre each, were as follows:—Ba. 11,569, B.H.10 (12), B.156, Ba.6,032, T.718, White Tanna, Uba. Both lots of plots were harvested during the first week of March 1925."

The rainfall figures for the period under consideration are given below:—

Table I.

	1923.	1924.	1925.	1926.	1927.
Jan.	3.20	3.09	2.52	1.36	7.30
Feb.	1.54	2.15	.62	.63	7.94
March	1.77	.18	2.52	.17	1.65
April	.50	.60	.59	.43	9.10
May	2.08	3.14	1.41	3.50	9.10
June	5.87	7.03	7.62	9.90	13.08
July	11.79	11.74	7.38	7.43	8.93
Aug.	8.06	11.05	14.03	12.89	10.77
Sept.	5.67	8.65	8.35	14.42	12.10
Oct.	8.40	8.92	6.01	4.17	6.85
Nov.	3.05	14.12	6.32	6.24	7.54
Dec.	7.26	4.10	5.73	6.74	10.37
Total...	59.19	74.77	63.10	67.88	104.73

The results for the last year are recorded in the Table below:—

Table II.—2nd Ratoons.

Variety.	Cane yield per acre.	Brix.	Sucrose in juice.	Purity.	Normal juice per acre.	Sucrose in normal juice per acre.	Available Sucrose per acre.	Sugar (96°) per acre.
	tons.		per cent.		tons.	tons.	tons.	tons.
Series A.—(Fall planted.)								
Badilla ..	30.8	18.45	15.37	83.32	24.64	3.79	3.49	3.63
B.H. 10 (12) ..	29.4	16.10	12.29	76.36	23.52	2.90	2.55	2.66
H. ? ..	24.4	16.10	13.26	82.39	19.52	2.59	2.36	2.46
Ba. 6032 ..	28.1	13.40	9.52	71.08	22.48	2.14	1.80	1.87
Series B.								
B.H. 10 (12) ..	38.2	17.15	13.73	80.06	30.56	4.20	3.78	3.94
Ba. 11569 ..	35.9	17.00	13.69	80.52	28.72	3.93	3.53	3.68
B. 156 ..	46.8	14.60	10.46	71.67	37.44	3.92	3.29	3.43
Ba. 6032 ..	40.9	14.15	10.54	74.50	32.72	3.45	2.97	3.09
White Tanna ..	37.7	14.60	10.92	74.82	30.16	3.29	2.86	2.98
T. 718 ..	29.3	16.75	13.47	80.38	23.44	3.16	2.84	2.96

In co-operation with the Department of Sugar Technology, the canes were analysed at the time of crushing and their approximate value as sugar producers worked out in the following way. Assuming a normal juice extraction of 80 per cent. the tons of available sugar are ascertained by Winter's formula :—

$$\left\{\frac{(1.4-40)}{\text{purity}} \times \text{indicated sucrose}\right\} \div \text{by } 96.$$

The ascertained purity from the small hand mill was reduced by 6 in order to make it more comparable to factory extraction. Thus to take an example : Badilla Series A :

Purity $89.32-6=83.32$.

Sucrose in juice $=\frac{83.32 \times 18.45}{100}=15.37$.

Then sucrose in normal juice is

$$\frac{30.8 \times 80 \times 15.37}{100}=3.79 \text{ tons.}$$

Then available sucrose in tons

$$\frac{(1.4-40 \times 3.79)}{83.32} = 3.49$$

and this ÷ by .96 = 3.63 tons of 96° sugar.

Table III.

Summary.

Variety.	Yield per acre, tons sugar.			Total.
	Plant Canes.	1st Ratoons.	2nd Ratoons.	
Series A.				
Ba. 6032	6.78	4.65	1.87	13.30
B.H. 10 (12)	6.78	3.85	2.66	13.29
Badilla	4.02	4.17	3.63	11.82
H. ?	5.60	2.88	2.46	10.94
Series B.				
Ba. 11569	4.55	7.75	3.68	15.98
B.H. 10 (12)	3.92	6.85	3.94	14.71
Ba. 6032	3.39	4.71	3.09	11.19
B. 156	3.83	2.47	3.43	9.73
White Tanna	2.98	3.52	2.98	9.48
T. 718	3.02	3.33	2.96	9.31

This table gives the summary of the results for the three years of these experiments and presents some features of interest. While it is perfectly true that the aim of the cane grower is the production of the greatest quantity of sugar per acre, it is interesting to compare two yields which have produced the same quantity of sugar but from a very different quantity of cane.

In the first year B.H. 10(12) reaped just 50 tons to the acre, Ba. 6032 reaped at over 70 tons to the acre, but the yield of sugar from these two have been exactly the same, and to the former is the credit of the saving in harvesting, shipping, bundling, carting and milling. The two outstanding canes are B.H. 10(12), which is already a favourite cane in the island, and takes second place in each trial, and Ba. 11569 which heads both series with the splendid yield of over 5 tons of commercial sugar per acre for three successive years. Mr. Dash considers that Ba. 11569 gives results which mark it as a cane deserving consideration on such soils. It appears, however, to have one drawback agriculturally—poor germinating qualities, unless the soil is in particularly good tilth, for this cane has very long joints which make it difficult to insert the cuttings completely. In the plots too, it showed a slight tendency to develop Mosaic disease. The best results as a plantation cane will probably be obtained by planting in seasonable weather avoiding soft and sappy planting material.

The other varieties need little comment. H.? was a seedling from Hawaii, the number of which appears to have been lost. White Tanna was disappointing, especially in the last year, when the heavy rainfall might have been expected to suit it. Badilla made a very good show in the last season. Owing to the continued rainfall and consequent high humidity, the sucrose content of all the juices has been low, with the exception of Badilla, which grew a cane of very fair quality, and produced actually more sugar than any of the other canes in Series A. This is the famous Queensland cane, which is also grown in Fiji, and is reported there to be resistant to Mosaic and Fiji disease. It was slightly affected in these plots with Mosaic.

The experiment has been discontinued.

R. C. W.

TANGANYIKA MEAT INDUSTRY.

The Government of the Tanganyika Territory, East Africa, intends to introduce legislation shortly which will have for its object the improvement and utilization of native cattle. The step in immediate contemplation is the establishment in the vicinity of Mwanza of a factory for the preservation of meat for both local consumption and export. The factory is to be established by private enterprise assisted by a financial guarantee by the Government, and the latter will, in return be entitled to a share in the profits in excess of a certain percentage on capital and to a voice in the management of the company.

There are roughly 3,000,000 head of cattle and about 5,000,000 head of sheep and goats in the Tanganyika Territory, even though stock raising is almost entirely in the hands of the natives and is therefore not carried out on scientific lines. Stock diseases are prevalent, but could be overcome, and as vast tracts of land are eminently suitable for ranching purposes the future before the meat industry is promising.—(*The Times Trade and Engineering Supplement*, No. 514, Vol. xxii.)

TROPICAL WORLD NOTES.

Jamaica.

The Colonial Report on Jamaica (No. 1376) states that the Colony's trade for 1926 was satisfactory. Imports amounted to £5,365,950 as against £5,386,435 in 1925, the decrease being due to a decline in the value of imported cotton piece-goods. Exports rose from £3,915,000 in 1925 to £4,236,855 in 1926. Banana exports reached the record figure of 18,301,410 stems and a further record of 20 million stems was reasonably expected in 1927. Trade in Dried Bananas has been revived and 300 tons were exported. Copra and sugar exports increased by 6,000,000 lb. and 10,440 tons respectively, while there were 3½ million less coconuts exported.

The coffee crop was depressed by unfavourable seasons to almost two-thirds of that in 1925 but prices were satisfactory. Cacao production has increased from 2,600 tons to 3,000 tons. The Fibre industry is steadily gaining ground and plantations of Sisal and Henequen are being extended, while the local invention of a portable decorticator has stimulated the prospects of growing this crop. The citrus industry is also showing some improvement, the exports of grapefruit having increased from 5 million to 7½ million and oranges from 106,000 boxes to 125,000 boxes.

Panama disease is the most serious of the crop diseases but is being prevented from rapid extension by the careful quarantining of every spot where it appears. Coconut Bud-rot is now of relatively rare occurrence.

* * *

Seychelles.

The annual Colonial Report on Seychelles for 1926 (No. 1375, H.M. Stationery Office, Kingsway, London, W.C.2, price 3*d*. net) places the total value of the trade of the colony (exclusive of imported specie) at Rs. 4,063,478, as compared with Rs. 4,297,800 in 1925, but, despite this slight decrease in value, the volume was satisfactory. Imports (exclusive of specie) amounted in value to Rs. 1,692,547, compared with Rs. 1,796,110 in the previous year, while exports were Rs. 2,370,931, as against Rs. 2,507,531.

Agriculture in Seychelles is mainly confined to the production of coconuts, and during the year about 83,900 coconuts were exported, as compared with 61,000 in 1925, while total shipments of copra amounted to 5,462 tons as against 4,873 tons in the previous year. The distillation of the cinnamon oil was continued energetically during the year, while increasing interest was shown in the distillation of patchouli, basilic, and lemon grass oil. Total exports of essential oils in 1926 were 46,183 litres, valued at Rs. 325,037, 1925 shipments amounting to 45,999 litres. Exports of vanilla declined considerably from 2,466 kilos., valued at Rs. 42,509, in 1925 to 550 kilos., valued at Rs. 4,568, while rubber shipped advanced in quantity from 4,936 kilos. to 6,700 kilos. Guano was shipped to the value of Rs. 206,880.

Bahamas.

Statistics published in the latest Government report on the colony (No. 1378, H.M. Stationery Office, Kingsway, W.C.2.) show that imports last year were valued at £41,885,475 which was £204,280 less than in 1926 but that exports at £483,773 had increased by £77,502. The general trade of the colony is still feeling the effects of the three hurricanes of 1926 and the collapse of the real estate boon. The value of the imports from the three principal countries of origin during 1923, 1926 and 1927 was as follows:—

	1923	1926	1927 (approx.)
United Kingdom	£ 758,041	£ 525,625	£ 438,424
Canada	160,610	462,273	401,224
U. S. A.	1,070,374	880,645	778,894

It will be seen that imports from both the United Kingdom and the United States of America have decreased considerably since 1923, while those of Canada which declined somewhat as compared with 1926 have risen substantially since 1923. The decrease of imports from Canada in 1927 as compared with the previous year is due to the general depression, and in no way affects the prospects of trade between Canada and the Bahamas, which are extremely hopeful provided that Canadian exporters will send competent salesmen to the colony to push the sale of their products.

With regard to exports, trade with the United Kingdom has decreased from £39,483 to £31,009 in 1927. Of some of the local produce the whole of the exports of tomatoes and Bahamas hemp go to the United States of America, while lumber is exported to Cuba.

Trade with the United Kingdom is hampered considerably by the fact that there is no direct mail service and that cargo steamers take about three weeks from England to the Bahamas and still longer on the return journey. New York, on the other hand, is less than three days by steamer from the Bahamas and it is therefore not remarkable that there should be a close trade relationship between these islands and the United States of America.

Tomatoes, pine apples and sisal hemp are the chief agricultural products of the islands. The tomato industry, only recently introduced into the Bahamas is rapidly growing and promises to replace that of the pine apple which is deteriorating through the lack of stock and the failure of the soil. Sisal hemp is a great help to the Out Islands peasant and tides him over many hard times. Owing to the invasion of the blue-gray fly only just enough citrus fruit is grown to meet the local demand, but active steps have been taken to revive the citrus industry and other forms of fruit culture.

The shortage of food caused by the hurricanes of 1926 was accentuated by a severe drought in 1927 which destroyed practically all the crops in the southern islands of the group.

Ceylon.

According to Colonial Report No. 1374 (published by H.M.S. Office, Kingsway, London, W.C.2., price 5s.) the year 1926 was an exceptionally prosperous one for the Colony. The value of the total trade during the year rose to the unprecedented figure of Rs. 921,673,555. Imports were 11 per cent. higher than in the previous year and the total value of exports rose from Rs. 199,697,534 in 1925 to Rs. 213,163,883.

The actual quantity of tea exported was 217,183,666 lb. valued at Rs. 213,163,883 which is the highest on record, while the average price per lb. rose from 95 cents in 1925 to 98 cents. The increase in export is attributed to the adoption of better cultivation methods and of liberal manuring programmes, and to a mild south-west monsoon on the west side of the island.

Rubber Restriction was in operation throughout the year but prices of rubber declined from an average of Rs. 1.73 to Rs. 1.21 for top grades. Exports, however, showed a large increase from 45,618 tons valued at Rs. 169,992,247 in 1925 to 63,621 tons at Rs. 184,423,215. The quality of both crepe and sheet rubber was well maintained and rust is now rarely seen on first class estate rubber as greater care is being given to the ventilation of smoke houses and to the drying of the crop. The importance of bud grafting as a means of selection is also being realised and a large number of estates are now taking yield records before budding. The demand for selected seed from high yielding trees in the Experiment Stations and in the Botanic Gardens was greatly in excess of the supply.

Of the other crops, prices for coconut products were generally satisfactory, but the exports were slightly lower than in 1925. Copra exports were in excess of those of the previous year. Paddy crops were on the whole satisfactory, but suffered from floods in certain areas of the east and north-eastern parts of the island. More seed stations for the supply of selected and tested seeds have been established. Cacao exports decreased as the autumn crop was small owing to the dry weather conditions which prevailed. Prices for the crop were low throughout the year and the cacao acreage continues to decline.

* * *

Tanganyika.

Although the early rains were insufficient in parts of the Territory, the position was saved by later useful rainfall, and it was only in a few restricted areas (chiefly in parts of the Lindi District) that shortage of food crops were reported the check at the beginning of the season reduced, however, the yield of these crops and ground-nuts. The best season was experienced in Mahenge, Rufiji, Bagamoyo and in what is normally one of the driest areas of the Territory: the Central Province (Dodoma).

The reduction in cotton production was due to the smaller sowings following upon low prices in the previous season; the ground-nut crop was considerably below anticipations (based on sowings) because of the bad season in the main areas of production Tabora and Mwanza.

The following export figures are given for the principal products of the Territory for the pre-war year 1913 and the years 1925, 1926 and 1927:

	1913.		1925.		1926.		1927.	
	Quantity. Cwts.	Value. £	Quantity. Cwts.	Value. £	Quantity. Cwts.	Value. £	Quantity. Cwts.	Value. £
Sisal Fibre	416,680	535,580	365,520	688,451	500,440	911,293	660,240	1,160,735
Cotton	43,840	120,753	90,043	540,481	97,723	427,437	78,814	361,916
Ground-nuts	179,220	95,932	181,100	178,685	317,340	254,903	282,940	238,082
Coffee	21,180	46,563	120,186	481,055	130,793	495,199	131,899	463,420
Copra	109,540	117,401	152,460	160,800	146,960	152,228	145,340	143,024

Of these products, ground-nuts are grown entirely by natives, sisal fibre entirely by non-natives and the remainder by both natives and non-natives.—(*From Department of Agriculture, Tanganyika.*)

COTTON NOTES.

A Contribution to the Classification of the genus Gossypium.

By Dr. G. S. Zaitzev, *Transactions of the Turkestan Plant Breeding Station*, No. 12, 1928.

This memoir, in Russian with an English translation, marks the first attempt to put forward a system of classification of cotton based on cytological, genetic, and ecological considerations. In the last number of this journal the writer was impelled to review somewhat unfavourably the recent contributions on the taxonomy of cotton put forward by Watt. Zaitzev criticises the classification of Watt in almost the same terms as the writer.

After an introduction dealing with the ecological peculariities of the genus Gossypium, the author established four independent groups of cotton which correspond to the four ecologically possible centres of "primary habitat."

The genus Gossypium is first of all divided into two main groups, according to whether the chromosome number is 13 pairs or 26. To the former group belong the cultivated Asiatic cottons of India, China, Persia &c. and the assemblage of wild or semi-wild forms of Africa like the Senaar tree cotton of the Soudan, which range from this region down through East Africa to the Transvaal. To the 26 chromosome group belong the New World cottons, comprising Sea Island, Egyptian, Upland, Peruvian, Bourbon, and the huge variety of perennial cottons scattered throughout Central and South America.

Sub-dividing the New World group, Zaitzev makes two broad divisions—the Central American sub-group, which embraces, according to the nomenclature of Watt, the species: *G. hirsutum, punctatum, mexicanum, mustelinum, Palmerii, fruticulosum, Schottii, lanceolatum,* (partly *microcarpum*), and *purpurascens* (Poir). The peculiarities distinguishing this sub-group are the smooth or slightly pitted surface of the boll, and the comparatively short and broadened, (auriculate) stipules of the main stem.

The second group of New World cottons is the South American group which embraces the species *G. peruvianum, purpurascens* (partly), *vitifolium* and *brasiliense*. The main peculiarity of this group is the conspicuously pitted and strongly glandular surface of the boll, and the comparatively long stipules of the main stem. To this group belong Sea Island and Egyptian, while to the Central American group belong the various forms of Upland. The cultivated perennials of Brazil, Ecuador, West Indies and Columbia contain a mixture of representatives of both groups.

Parallel to the Central American sub-group of cottons are the African sub-group of Old World cottons, producing bolls with a smooth surface, and comprising the sub-group *G. herbaceum* and *obtusifolium* of many authors (excepting Roxburgh).

Parallel to the South American sub-group is the second sub-group of the Old World, which comprises the cottons of South Eastern Asia, and which comprises the two species *G. arboreum* and Nanking.

The author emphasises the fact that although the natural distribution of these four groups has been considerably interfered with by human agency, it is not difficult even now to locate the original areas from whence distribution has taken place.

To the main classification of Zaitzev the present writer has no serious objection. The following points however may be raised:—

1. While it is clear that the main division in the New World cottons is into the Peruvian type with strongly pitted bolls, and the Bourbon type with smooth bolls, it is not clear to what extent these two types really differ essentially in distribution. The Peruvian type certainly belongs to South America, and does not extend, so far as we know at present, very much north of Panama. The Bourbon type does however extend southwards into Brazil and into Ecuador in its strongly perennial forms, while its more sympodial forms—exemplified by such types as the native Khaki cotton of Guatemala and the assemblage of annual cottons native to Mexico, do not exist south of the Panama canal. It might be well to make a further sub-division of the Central American group into two parts, (*a*) the Bourbon Group, the most characteristic feature of which is the late bursting anthers, and the monopodial habit, and (*b*) the Uplands group, comprising cultivated Uplands and the sympodial natives with early bursting anthers of northern Central America. It may be said definitely that the genetic differences in the Upland and Bourbon groups are far greater than those distinguishing the two main groups of Old World cottons.

2. Zaitzev's attempt to bring the Old World cottons into line by similarly sub-dividing them into smooth bolled and a pitted bolled sections characteristic of Africa and Asia respectively does not seem to the writer to be on very safe ground. Certainly any sub-division of Old World cottons means far less in terms of genes than that of New World cottons and although smooth and pitted bolled cottons do exist in the Old World it is not clear that they are indicative of such a complex of deep seated differences as exists in the Peruvian and Bourbon groups.

With Zaitzev's treatment of the wild species of Gossypium the writer finds himself in complete disagreement. Zaitzev would actually propose to remove the species *G. Sturtii, Davidsonii, Klotzschianum, Robinsonii, Darwinii, tomentosum, drynarioides, Harknessii, Stocksii, and Kirkii,* from the genus Gossypium altogether.

Of these species, Lewton, apparently with good reason has already removed *Robinsonii* and *drynarioides* from Gossypium. He assigns the former to Cienfugosia, and makes a new genus, Kokio, for the latter.

As regards the rest, it has been shown that *Stocksii* will cross with *arboreum* and *herbaceum*, although the hybrids (Leake) did not flower, and its chromosome number is 13, corresponding with that of the ordinary Asiatic cottons. Further, it will graft on both Old and New World cottons with the greatest ease. There does not seem to be any valid reason for removing *Stocksii* from the genus Gossypium.

G. tomentosum, Nutt. is decidedly a cotton. Not only does it cross with both Sea Island and Upland with the greatest ease, but produces perfectly fertile hybrids. Its chromosome number has not yet been determined, but from a consideration of the volume of the pollen grain it is most probably 26. *Tomentosum* may thus be regarded as the most primitive member of the New World section of the genus.

G. Davidsonii must also be considered as a cotton. It will graft on to New World and Old World cottons; its chromosome number is 13, and hybrids have been effected with Sea Island cotton although these did not survive beyond the cotyledonary stage.

G. Sturtii there is some doubt about. It will graft on to cotton, but its cotyledons are bilobed, the leaves are heart shaped and covered with a waxy bloom, and the flowers are mauve—a colour not elsewhere found in the genus Gossypium. The chromosome number is not yet known.

With the other cottons mentioned the writer is not acquainted, but enough has been said to make the definite statement that even now the boundaries of the genus Gossypium are not yet delimited.

S. C. HARLAND.

STANDARD INDIAN COTTONS.

TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1927. By A. J. Turner, M.A., B.Sc., Director of the Indian Central Cotton Committee Technological Laboratory, Bombay, illustrate well some of the many and various lines of research which converge on the improvement of the cotton crop.

Reports are given on eighteen standard Indian cottons and three Americans tested for comparative purposes, each report comprising:—(I) Agricultural Details. (II) Grader's Report. (III) Fibre particulars. (IV) Spinning tests. (V) Remarks.

The agricultural details include botanical species, history, district of growth, soil, rainfall, temperature, yield, ginning percentage and area under cultivation. The fibre particulars include sorter determinations of mean lint length and lint-length distribution, hair-strength, hair-weight per unit length, rigidity, ribbon-width, and convolution counts. It is pointed out that one branch of the Laboratory's work is investigation of the exact relationship between these lint properties and the performance of the cotton in spinning tests.

The general aim of all the tests made is "to accumulate data for the investigation of the methods of determining the intrinsic value of a cotton," this intrinsic value depending upon the quality of yarn which can be made from the cotton, the behaviour of the cotton during spinning, and the amount of waste to which it gives rise.

The specific aims include first the preparation of a series of standards by which to judge other cottons, particularly new cottons produced by cotton breeders, and subsidiary to this the determination of the extent to which these standard cottons are affected by seasonal variations.

Another important line is the determination of the minimum weight of cotton on which a spinning test can be carried out satisfactorily. It is explained that the cotton breeder needs to have a spinning test made on a sample of any promising new strain at the earliest possible moment. With the facilities of staff and land available to him he must limit somewhat narrowly the number of strains grown at one time, and cannot multiply them all to any great extent. Three generations at least are necessary to obtain a few pounds of lint, and the sooner the spinning test can be made after that the better. The conclusion reached is that results from tests in duplicate on lots weighing only 5 lb. each are reliable, at least within the range of counts possible with Indian cottons.

Differences in card-room waste percentage on samples of different weights were found to be due to the cotton required to load the card wire, which is one-tenth of a pound in each case. Similarly, 2 lb. samples always gave a less neppy yarn than that spun from larger samples, because the cleaned card is at first able to extract practically all the nep from the cotton which passes through it, the amount of nep appearing in the web only reaching its maximum after about a pound and a half of cotton has passed through. These facts being known, and due allowance for them made, the small samples can be used.

The value of the spinning test lies in the help it gives to the breeder in dividing his cottons into (1) Strains worth multiplying and extended field testing. (2) Strains worth further study and (3) Strains not worth multiplying. No strain would be finally rejected on a single spinning test alone, but the test in conjunction with field observations and all the considerations which a cotton-breeder has to take into account, is a useful guide.

E. E. C.

WE have to acknowledge with thanks the gifts of a picture representing the Fathers of Confederation and of a book entitled "Sixty years of Canadian Progress" which was presented to the College by Mr. F. G. Grant on behalf of the Confederation Life Association of Canada.

EXPERIMENTAL SUGAR FACTORY.

Summary of Crop Activities, 1928.

W. SCOTT, B.SC.

THE College Factory began grinding on 15th March, and continued in operation until 24th May. During that period a combined programme of instruction and research was carried out, a summary of which is given below. As during the 1927 crop, the mills were operated for ten hours daily (6 a.m. to 4 p.m.) grinding on an average 2.98 tons of cane per hour. The total quantity of cane ground amounted to 1272.6 tons from which 127.9 tons of sugar (including sugar equivalent of cane syrup) were made. Cane was supplied to the factory by the Cotton Station, the Government Farm and the College Experimental Plots; and was paid for according to its Sucrose Contents.

The following figures are taken from the final chemist's report and may prove of interest:

	1928.	1927.
Sucrose in Cane per cent.	13.09	9.96
Fibre in Cane per cent.	12.80	13.61
Sucrose in Megass per cent.	4.31	4.48
Fibre in Megass per cent.	47.33	43.91
Moisture in Megass per cent.	47.29	49.94
Normal Juice Brix	18.49	15.17
Do. do. Sucrose	15.62	11.83
Do. do. App't Purity	84.49	78.02
Do. do. Glucose Ratio	10.04	15.42
Final Molasses, App't Purity	42.38	33.34
Cane Ground, Tons	1272.65	1288.92
Do. do. per hour, Tons	2.98	2.89
Sugar made, Tons	127.88	93.56
Tons Cane per Ton Sugar	9.95	13.77
Sucrose in Juice per cent. Sucrose in Cane	91.00	86.07
Sucrose in Sugars per cent. Sucrose in Cane	74.74	69.81
Sucrose in Sugars per cent. Sucrose in Juice	82.04	81.11
Fuel Oil Consumed, Tons	92.80	55.11

Various types of sugar were manufactured including White refined Sugar, White plantation Sugar, Demerara Crystals, Light and Dark Grey Crystals. In addition to the Sugar, about 800 gallons of Cane Syrup were manufactured. A portion of this Syrup was exported in casks, and the remainder marketed in 2 lb. and 5 lb. tins.

New machinery was installed during the past year, the principal items being a 15 K.W. motor-generator set, an electrically-driven induced draft fan for the boiler plant, and a new molasses tank. Other minor items included a new trap, drainage pump, galvanized iron tank and shed for fan.

It is satisfactory to note that the cost of normal upkeep and operation of the factory (not including items of capital expenditure mentioned above) was practically covered by the sale of its produce.

The three students who took part in the crop operations were third-year men. The practical training of third-year students bears principally on the chemical control of the factory, and the practical operation of every station. They were therefore assigned in turn for duty to the Laboratory for a period of a week, then placed in charge of various stations in the factory the following week. The laboratory training included the routine analyses of various factory products, checking of factory samples, elaboration of daily and weekly chemists' reports, and stock taking. In the factory, they took a direct part in the operations of each station, and in the correction of bad work generally including clarification, false grain in the pan, &c. Before grinding operations began, the students helped in the assembly of the machinery; and were given every opportunity of observing the construction of the different items of the plant. Fourth-year students are generally given a greater share in the research end of the factory work. In addition they are expected to help third-year students in their laboratory work, and to take a part in the general supervision of the plant. During the past crop, our single fourth-year student was unfortunately absent through illness; we, however, look forward to his return next year, and to a greater variety of research problems to be divided among the four prospective fourth-year students during the 1929 crop.

A number of investigations were carried out by the research section of the department during grinding operations. Problems connected with the following subjects were studied:

1. The manufacture of high grade cane syrup direct from cane juice.
2. The manufacture of white sugar: (*a*) from remelted raw sugar, (*b*) direct from cane juice.
3. The relative efficiency of various methods of clarification of cane juice in the manufacture of:
   (*a*) raw sugar;
   (*b*) yellow (Demerara) crystals.
4. Hot versus cold liming in the clarification of cane juice.
5. The centrifugal and supercentrifugal clarification of syrups and molasses.
6. The relative efficiency of various preservatives commonly used for cane juice samples.

Investigations (5) and (6) were entirely carried out in the laboratory; while the other experiments were on a factory scale. Preliminary work was, however, done in the laboratory with a view of finding the optimum conditions for each process before experiments were undertaken on a large scale in the factory. Considerable time was thus saved, and disorganization of the factory work avoided.

The results of the investigations, work on some of which is still proceeding, will be published in the latter part of the year.

In our cane syrup investigations we received the valuable help and co-operation of officials of British Suchar Processes Ltd. Some points connected with the reduction of cost of manufacture still remain to be worked out, and will receive attention next year. The detailed process of manufacture of this syrup will be mailed by the Editor of *Tropical Agriculture* to interested parties.

A few remarks would not be amiss to explain our object in developing this type of syrup. A high grade of cane syrup is at the present time manufactured in certain West Indian Islands, principally in Barbados. This syrup is partly sold for direct consumption ; but a large proportion is bought by large syrup and molasses firms in the U.S.A., and elsewhere, for blending purposes. Owing to restrictions on the use of chemicals for inverting purposes, &c., it is not usually possible to concentrate the original syrup to a high density without crystallization and turbidity-developing. On the other hand, unless syrup is highly concentrated it is easily subject to fermentation. Heavy losses are often caused by the fermentation of syrups during storage or shipment. The process of manufacture developed at the Imperial College allows a very high degree of concentration to be obtained without any danger of crystallization or turbidity-developing. The syrup is besides practically free of any added chemicals, since the only chemicals used are lime and phosphoric acid in the clarification of the juice and those are practically eliminated during clarification. The syrup resulting from this process is of too high a grade, and probably too expensive, to be used by firms engaged in the blending of syrups and molasses. It must therefore be sold for direct consumption. The investigation of suitable markets is one of the problems receiving special attention at the present time.

The investigations of the past season, apart from actual results obtained, have suggested further lines of investigation which will form the basis of interesting research work in the near future.

ST. VINCENT DAIRY.

THE Administration Report of the Medical Department of St. Vincent gives the following appreciative note on the Ottley Hall Dairy Farm, owned by Mr. Conrad Hazell. " There is but one dairy in the island, but this is fast approaching the ideal. The dairy is situated on an elevated site away from other houses ; it is built of solid masonry, provided with a wholesome water supply, and has fifty-one stalls. A fly-proof milk room and wash room stands thirty yards away from the main building and is paved with white tiles to conform to the colour of the room. The milk which is run into the milk room by a funnel leading from the milking stalls, passes through a seamless filter. At present, the dairy which supplies the Government Institutions, and also makes butter and cream for sale, turns out around 200 bottles per day."

JAPAN'S INDUSTRY AND TRADE.

THE INDUSTRY AND TRADE OF JAPAN, S. Uyehara, M.SC., P. S. King & Son, Ltd., pp. xv+326. Price 15*s*.

Although present day writers on the economic situation of Japan make Dean Inge seem like a second Mark Tapley, there is no doubt that this small country has made great strides since the Meiji Restoration around 1865. Prior to that time over-taxed farmers and dissatisfied Samurai (military) contributed to an internal *malaise* and the country itself was isolated from the rest of the world by the Dictates of the Shogun. Such a condition and isolation were incompatible with the world economic development of the 19th century and as soon as the Imperial regime was restored, many reforms and changes were successfully undertaken in the political, social and economic spheres. At first industrial and commercial undertakings were sponsored and controlled by the state but by 1894, the period of the Japanese Chinese War, state control gave way to private enterprise. A record stage of industrial development took place in the period (1904-1913) between the Japanese-Russian Wars and the outbreak of the Great War but this was surpassed by the unprecedented development which followed the Great War, which proved " a real stimulus and a golden opportunity for her to equip factories thoroughly with modern machinery and to establish industrial methods in accordance with up-to-date requirements." Japan's commercial and industrial policy for the last half century has been protective and the author thinks this should be modified in the direction of free trade. Parallels in history are apt to be misleading but it seems that Japan's position approaches that of Great Britain in the middle of last century.

Part 5 of the book, which gives surveys of representative industries—silk, cotton, mining, engineering, and sugar is particularly worth attention. By reason of cheap labour, geographic position with regard to Asiatic markets, protective policy and industrial organisation, great advantages have been got for the *cotton industry* and the consumption of raw cotton between 1913 and 1923 increased 43 per cent. The product stands between that of Indian and that of Lancashire, being finer than one and coarser than the other. *Mineral resources* are poor, and the chief ones, copper and coal, do not show promising signs of future greatness. As a maritime country Japan (6.2 per cent. of world's tonnage) now stands next to Great Britain (36.7 per cent.) and the United States (20.4 per cent.). The *sugar industry* started developing on modern lines after the acquisition of Formosa, which was ceded to Japan by China by the Shimonoseki Treaty and has become one of the most successful colonial industries Japan ever undertook. It was fostered by protection and the cane crushing capacity per day rose from 300 tons in 1897 to 36,600 in 1923. Under main clauses of the present sugar subsidy Act (1922) the Government undertakes to provide for free supply of young canes, to

bear half the cost of work of drainage and irrigation, and to lend its manufacturing machinery and implements to anyone deemed suitable. In addition, areas of cane supply for factories are limited to prevent competition and price rise. Despite the subsidies and the high tariff barrier against imported sugar, the Formosan companies have often been threatened by the keen competition of foreign sugar especially Java sugar. Refineries operated in Japan but until 1911 were distinctly different from the raw sugar companies of Formosa. Later the Dai-Nippon Seito Kaisha opened sugar cane farms in Formosa. Raw sugar companies also purchased refineries in Japan and by 1911 the two sides formed the Japanese Sugar Association for the purpose of checking foreign raw sugar from coming into the Japanese market, and subsequently imports of foreign raw sugar gave way to Formosa raw sugar.

As a picture of the economic position of Japan, the book fills its purpose admirably. Little sustained criticism is however levelled at the more doubtful facets of economic policy. On a point of presentation, criticism may be offered that statistics are given in terms of yen, kin, ko, &c., and nowhere is there a table of their values in English terms.

G. W.

KENYA SUGAR.

An encouraging description of the success attending the production of cane sugar in Kenya Colony was given by Mr. G. R. Mayers, Managing Director of the Victoria Nyanza Sugar Company, Ltd., at their sixth annual meeting. Mr. Mayers said that the profit earned by the Company during the period under review (for the 13 months ended 30th April, 1927), amounted to £96,578. Of the total assets of £354,457, land and buildings amounted to £45,859. The land originally cost £3 5s., while to-day its market value was between £6 and £8 an acre. Mill buildings, plant, &c., were valued at £156,980, which was an extremely low cost for a mill capable of producing over 8,000 tons of white sugar a season. The plantation development account which represented a plantation of 5,000 acres of cane, practically a two-year supply of cane for the mill, 2,000 acres of cleared land not under cane, together with all improvements such as roads and drains amounted to £45,429. Since commencing operations the Company had manufactured and sold to date over £600,000 of sugar without incurring a single bad debt. Before the Company's advent Kenya was purchasing from foreign countries approximately £200,000 worth of sugar every year.—(*The Argus.*)

THE EDITOR is prepared to consider signed articles for publication in *Tropical Agriculture.* Such articles should normally vary between 1,000 to 6,000 words and may be illustrated if desired. Rates can be obtained on application to the Editor.

BRITISH GUIANA.

Agricultural Report for 1926.

THIS report, for the year ending 31st December, 1926, is in the nature of an interim report, for in February, occurred the death, after prolonged illness, of Sir John B. Harrison, who had served the Colony with great distinction for thirty-six years as the Director of Science and Agriculture. He was succeeded in November by Mr. Nowell, who after just a fortnight, left to take up the post of Director of the Amani Research Institute in East Africa. The report is written by Mr. Francis, the acting Director, who now holds the post of Government Analyst.

The area under cultivation in the coastal areas during the year under review, is put down at about 160,000 acres, mostly under sugar cane (57,500 acres), rice (50,000 acres), coconuts (30,500 acres), coffee, cocoa, limes and various food crops. The cost of the Department is roughly $96,000, or about 60 cents an acre, which seems high, though it includes the cost of a considerable analytical Department, and the upkeep of the very handsome Botanic Gardens since separated.

The feature of the year seems to have been the severe drought, which lasted from September, 1925, to April, 1926, during which period only 14 inches of rain were registered. Cattle suffered severely, the spring crop of rice was a poor one, and damage was done to many of the permanent specimens in the Gardens.

Of more than local interest may be noted the careful work done on Rice Pests by the Economic Biologist, and the discovery that the rate of spread of an Antidesma which had escaped from cultivation, was not so rapid as had at one time been suspected. The discovery was due to the correct identification by Kew which showed that the original importation was much earlier than had been thought, and that the plant need not be regarded as a danger to Agriculture.

The publication takes the form of a report by the Director, mainly for the information of Government, and dealing largely with matters of administrative detail, with appendices by some of the specialist officers. It is becoming more common to confine such reports to bare administrative matters, leaving the staff to publish the results of their work in a Year Book.

R. C. W.

CINCHONA BARK.

CINCHONA Bark from Uganda has been found at the Imperial Institute to contain 3.72 per cent. of quinine, against the 7 to 8 per cent. of quinine found in the Ledger Bark. A firm of brokers has placed the value of Cinchona bark for manufacturing purposes at about 4*d.* to 4½*d.* per lb. ex-wharf London, and is of the opinion that it will probably meet with a fairly ready demand at this price.—(*Chamber of Commerce Journal,* Vol. LV, No. 742.)

REVIEWS.

THE BANANA.—Its History, Cultivation, and Place among Staple Foods. By Philip Keep Reynolds. Houghton Mifflin Company, Boston and New York, 1927. Price $2.00.

Probably few of the millions in North America and Europe to whom the banana is a common food know much about its growth or anything at all of the organisation which brings it to them. Mr. Reynolds has written what may be described as a non-technical account of the history, geography, botany, chemistry and economics of the fruit, and produced a book which should prove, to those readers whose tastes incline towards information, more interesting than many novels.

The main story is that of one banana variety, the Gros Michel, its cultivation in Central America, and its journey by the steamers and railway vans of the great distributing organisation of the United Fruit Company and its subsidiaries to the retailer's shop.

Worked into the theme, however, is a great deal of other information. The first chapter, for example, deals with the botanical ancestry and relations of *Musa sapientum* in its numerous varieties, and the next with its earliest recorded history in the various tropical countries of the world. At later points in the book we find an account of the cultivation of *Musa Cavendishii* in the Canary Islands, a long chapter on the food value of the fruit, and a brief account of the ancient Maya civilisation of Central America and the conquest by modern methods of sanitation of the diseases which probably broke that civilisation centuries ago.

The book is illustrated by many excellent photographs, and commendably free from misprints.

E. E. C.

* * *

INDIA IN 1926-27. By J. Coatman, Government of India, Calcutta, Central Publication Branch. Price Rs. 2 or 3*s*. 6*d*., pp. xvi + 377.

This is an official publication issued annually by the Government of India and compiled by the Director of Public Information. Mr. J. Coatman, the present incumbent of this post has, endeavoured, with considerable success, to include mention of as many of the major events of the year as possible in his publication. The task is a colossal one as can readily be imagined, bearing in mind the enormous area and population of the Indian Empire, and also having in view the fact that the position of the East, at any rate, is changing, and that the kaleidoscope of events is now moving much more rapidly than in pre-war times. An excellent abstract is given of the current events of what appears to have been a fairly prosperous year for India. The report is well arranged and indexed, and is profusely illustrated with photographs and diagrams.

G. E.

LIME AND MAGNESIA. By N. V. S. Knibbs, Ernest Benn, Ltd., pp. 306. Price 30*s*. 6*d*.

Lime burning is one of the oldest chemical industries. It is therefore strange that only in recent years have attempts been made to improve the process by a study of the chemical and physical reactions involved. Old methods and empirical knowledge have resulted in a variable product. A demand for a uniform and dependable substance has stimulated research in lime burning and lime hydration problems. This book represents the first essential step in all organised research, namely, the collection and review of the previous work on the subject.

This book is divided into three sections (1) Chemical, (2) Manufacture, (3) Uses. To attempt to include all our knowledge on lime and magnesia from these three aspects in one volume of this size, is an almost impossible task. Although magnesia takes a secondary place, the result gives an impression of scantiness. The first section is undoubtedly the best; and, supplemented by numerous references and a lengthy appendix of tables and methods of analysis, becomes an excellent reference work on the subject. The wide scope of the work may account for the omission of one or two modern manufacturing methods in use before the date of publication. In the final section, the writer attempts to describe the use of lime in over sixty manufacturing processes and in agriculture in under seventy pages. Sufficient material for another volume is included, with the idea presumably, of giving the manufacturer of lime an indication of the requirements made from his products.

The volume is well produced, and section 2 contains numerous photographs of plant. It appears to be valuable chiefly to the research chemist as a reference book, and to the general reader.

H. H. C.

To the December, 1927, issue of the *Estate Magazine*, issued by The Country Gentlemen's Association, Ltd., Dr. A. G. Ruston of Leeds contributes a brief analysis of the results of an extensive study, covering 8 or 9 years, of the economic possibilities of farming in Yorkshire under varying conditions and different systems of farming. His material is already so compressed that any attempt at summary would involve distortion. His conclusions tend to suggest that a more intensive use of the land would be more profitable, or less unprofitable, and that salvation cannot be expected by rent or wage reduction. An examination of the size of the most successful holdings suggests two peaks in the curve of economic efficiency, one approximating to 150 acres and the other to 350 acres. The article is well worth critical examination as an example in method.

C. Y. S.

HUNTING UNDER THE MICROSCOPE. By Sir Arthur E. Shipley, G.B.E., F.R.S. Edited by C. F. A. Pantin, M.A. Ernest Benn, Ltd., Bouverie House, Fleet Street.

According to the Introduction, this little book is a collection of articles previously published in *Discovery*, on microscopic pond life, which Sir Arthur had commenced to arrange for publication. Mr. Pantin, who had been asked to help with the work has, since Sir Arthur's death, completed the assembling and arrangement of the articles.

The first two chapters of the book are entitled Suspended Animation, and the last (Chapter XV), Sir Ronald Ross and the Malaria Problem, while the others give accounts of microscopic organisms easily to be found and observed by those who are interested.

At the present time the rôle of insects in the transmission of disease is a commonplace, particularly to dwellers in the tropics, and the difficulties which faced the pioneers who attempted to demonstrate the proofs of the "Mosquito Theory" are liable to be forgotten or overlooked. The chapter on Sir Ronald Ross, reviews some of the most important of that pioneer work, in a most readable manner.

The chapters on the minute living organisms are in the happy style of that eminent scientist who knew so well how to write for the non-scientist. The book will be welcomed by many as another record of the clear presentation to the lay reader of the story of science, and as a souvenir of the late Sir Arthur E. Shipley.

This book contains an excellent portrait reproduction of the Author.

H. A. B.

* * *

REPORT OF THE INTERNATIONAL CONFERENCE ON TROPICAL PRODUCTS, edited by Sir Wyndham Dunstan, K.C.M.G., F.R.S. and Professor Em. Perrot, H. Greville Montgomery. pp. 334. Price 15*s*.

This work is a collection of addresses on rubber and other tropical products delivered at the conference. The papers on rubber (123 pp.) deal with the agricultural, technical and economic aspects. Many of them are concerned with alternative uses for the product.

Hauser—Concentrated latex and its industrial use.
Gotz—Sprayed rubber.
Spoon—Preservation of fresh fruit with latex.
Bois—New uses of rubber.
Bongrand—Le caoutchouc et le problème de la chausseé moderne.

The article by M. Alcan—Le marché du caoutchouc brut, together with its diagrams, gives a most useful survey of the recent price history of the crop. Other portions cover cocoa (11 pp.), cotton (14 pp.), rice (9 pp.). The section on oil palm (77 pp.) includes an article by Mr. Jorgensen on "The Oil Palm Industry in British Malaya." A guide to the whole is given at the end in the "Analyse et Resumé des Observations" by Professor Em. Perrot.

G. W.

CORRESPONDENCE.

To the Editor.

SIR,

May I again ask for space in your columns to remove a misapprehension which appears to have arisen about a review which I wrote for *Tropical Agriculture* on the Official Year Book of the Union of South Africa, 1910-1925, and in which I made certain remarks about the Union Department of Agriculture. It appeared in the May issue. I did not intend to imply any criticism of the personnel of that Department, but simply to express my own personal opinion that organisation into separate Divisions, as described in the Year Book, must make it difficult for the Technical Officers to keep effectively in touch with farmers in such a scattered country as South Africa. That was what I intended to convey, and I wish to apologise for anything I have written which can be construed as a criticism of the officers of the Department, and so has given offence.

I am,

Yours faithfully,

R. CECIL WOOD,
Professor of Agriculture.

BOOKS RECEIVED.

WE have to acknowledge the receipt of the following books:—

AGRICULTURE.

Studies of Quality in Cotton. W. L. Balls, p. 376, *Macmillan & Co., Ltd.*, 20*s*.

BOTANY.

The Families of Flowering Plants, I. Dicotyledons. J. Hutchinson, p. 328, *Macmillan & Co., Ltd.*

An Introduction to the Structure and Reproduction of Plants. F. E. Fritch and E. J. Salisbury, p. 458, *G. Bell & Sons Ltd.*, 20*s*.

An Introduction to the Study of Plants. F. E. Fritch and E. J. Salisbury, p. 398, *G. Bell & Sons Ltd.*, 7*s*. 6*d*.

ECONOMICS.

Marketing. C. S. Duncan, p. 500, *D. Appleton & Co.*

Co-operation in India. H. W. Wolff, p. 298, *Thacker & Co.*

Lancashire under the Hammer. B. Bowker, p. 128. *The Hogarth Press*, 3*s*. 6*d*.

Latter Day Rural England. S. L. Bensusan, p. 222, *E. Benn, Ltd.* 8*s*. 6*d*.

Man and His Markets. L. W. Lyde, p. 186, *Macmillan & Co., Ltd.*, 3*s*.

GENERAL.

General and Regional Geography. J. F. Unstead and E. G. R. Taylor, p. 518, *G. Philip*, 7*s*. 6*d*.

A History of Lloyds. Chas. Wright and C. E. Fayle, p. 476, *Macmillan & Co., Ltd.*, 25*s*.

CHEMICAL NOTES.

Compiled by the College Department of Chemistry and Soil Science.

Effect of Fertilisers on Tobacco.

In considering the effect of fertilisers on tobacco, two main factors must be taken into account. Firstly, the fertiliser may increase the yield of the crop and, secondly, it may increase or decrease the quality of the dried tobacco. Trial showed that of the many fertilisers tried phosphatic fertilisers produced the greatest effect on tobacco growing in a reddish-brown silt loam soil. Applications of phosphate varying from 22 kg. to 65 kg. per hectare gave an increased yield and improved quality tobacco, both yield and quality improving with increasing phosphate application. Bone meal gave better results than super-phosphate. Application of nitrogenous or potash fertilisers alone, or lime alone, gave no marked increase in yield.

On a sandy soil, again phosphatic fertilisers produced the largest yield. Nitrogenous and potash fertilisers also gave an increase on this soil, while farmyard manure improved the yield slightly.

Nitrogen applied as sodium nitrate and as ammonium sulphate gave identical increases in yield, but the latter form produced tobacco of better quality. Organic fertilisers and green manure improved the quality more than inorganic fertilisers.—(A. V. Otryganiev and D. V. Baland, State Inst. Tobacco Invest., *U. S. S. R. Bull*, 43, 1928.)

* * *

Organic Manures and Artificial Fertilisers.

A suggestion is made by C. M. Hutchinson (*Agric. Journ.* India, XXIII, 80) that artificial fertilisers be mixed with applications of organic manures. It was found that the application of a mixture of 12,000 lb. of cow-dung and 60 lb. of Sulphate of Ammonia per acre gave a greater economic return than the application of 16,000 lb. of cow-dung alone. Moreover, the more readily available supply of nitrogen in the mixture gave a more rapid return in the crop. The idea is particularly applicable in India where cow-dung is the main fertiliser used and, at the same time, the supply is limited. The peasant thus tends to concentrate his supply of manure on his good lands rather than attempting to recover his poor land. Assuming that the physical condition of the good land is superior to that of the poor land, there will be greater response to the fertiliser on the former than on the latter. Also, the available nitrogen and not the humus content becomes the determining factor for yield increase on the good land whereas on the poor, the humus content of the soil plays the most important part. As the nitrogen content of cow-dung is relatively low, a fairly heavy application is necessary to produce an immediate and appreciable increase in crop on the good land. These lands are therefore treated in excess of their humus requirements.

By raising the nitrogen content of the manure by addition of Sulphate of Ammonia, the application of an excess of humic matter to a good soil can be avoided without affecting the increase in yield. The supply of organic manure can thus be made to cover a wider area.

In poor lands of low humus content, any reduction in the amount of organic matter applied would be a short-sighted policy, although additional Sulphate of Ammonia will probably still give increased yields. In conditions similar to those obtaining in India, however, the practice of such mixing may mean the saving of large areas of comparatively poor land.

* * *

Application of Artificial Fertilisers to Cotton.

The value of a general fertiliser for cotton is largely determined by the relative proportions of phosphate, nitrogen and potash present (the P.N.K. ratio). Although certain mixtures may give high yields they may not necessarily be economic. On practically all soil types, a high proportion of nitrogen produces good yields but the amount which may be added is limited by its cost. The problem is complicated by the fact that different soil types have different optimum mixtures. It was found that hill soils responded more effectively to applications of phosphates than plain soils, while the reverse was true of the application of potash salts. For American cotton growing on the lighter hill soils, 600 lb. per acre of a mixture of 10 parts of phosphate to 4 parts of nitrogen and 3 parts of potash was found to be the most economical mixture. For the heavier plain soils the optimum P.N.K. ratio was 7-5-4.

The effect of the various types of nitrogen depended largely on the conditions of the soil. Nitrates and ammonium salts produced the highest yields. The relative effect of these two depended chiefly on the acidity of the soil. As would be expected, nitrates were most effective on acid, unlimed soils. When lime was applied as well, however, there was little difference between the effects of the two.—(D. J. Burleoon *J. A. S. Agron.* 20, 202, 1928.)

* * *

Fertiliser from Molasses Fermentation Waste.

The waste material left after the fermentation of molasses for industrial alcohol contains nitrogenous and potash compounds. It is therefore valuable as a fertiliser. The nitrogen may be recovered by burning the waste but large amounts of nitrogen are lost in the process. The presence of glycerine normally hinders the preparation of a suitable fertiliser from the waste. In some cases the glycerine is being removed to form a further by-product. When this is not done, fertilising material which can be easily handled may be prepared by mixing the waste with "saturation lime." The product contains 2-2.3 per cent. nitrogen, 5-5.4 per cent. potash, 0.6-1 per cent. phosphate, 28-30 per cent. lime, and 26-28 per cent. organic matter.—(E. Bauer, *Oestew Chem. Ztg.* 1928. 31, 39.)

SUGAR NOTES.

Compiled by the College Department of Sugar Technology.

Electrolysis of Sugar Juices.

The author has been occupied for several years with studies on the Say-Gramme process for recovering sugar from sugar juices and molasses This process has been tried out at Hawandieh in Egypt, at the Suikerraffinaderij in Amsterdam, at the sugar factory Piesdorf in Germany, and at the Tirlemont refinery in Belgium.

The process is really an electrodialysis, and is carried out as follows: use is made of an electrolyzer in three parts, an inner compartment containing the juice and two exterior electrode compartments, of which one contains acidulated water and the other water having an alkaline reaction. When the two electrodes are joined in an electric circuit the salts, such as K_2SO_4 for example, contained in the juice are ionized; K passes to the negative electrode where it forms KOH and Hydrogen; SO_4 passes to the positive electrode (consisting of an iron plate) where H_2SO_4 is formed and iron is dissolved with formation of ferrous sulphate; at the same time a portion of the non-electrolytes of the juice are coagulated and partly settle out or are deposited as a slimy coating on the parchment membranes which separate the compartments.

The action of the current tends to free the juice of its ash constituents. By subjecting crude juice to electrolysis the purity may be raised to 96° or 97°; by treating molasses by two electrolytic operations, each lasting two hours, the purity is raised from 60° to 92°. The power consumption is about 1.25 kwh. per ton of beets and about 4 kwh. per 1,000 litres of molasses diluted to 15° to 18° Brix. In sugar factories having high pressure boilers this power can be and is obtained without having an excess of exhaust steam. However, the process has certain drawbacks; a certain amount of sugar diffuses into the electrode compartments and is lost; there is also some diffusion of electrolyzed salts back into the central compartment, which makes it necessary to re-treat a part of the sugar solutions; for every ampere of current there is a definite amount of iron dissolved from the electrode in the acid chamber. Further, polarization phenomena at the electrodes make it necessary to wash out the apparatus and reverse the cells; the parchment membranes become fouled and thus offer increasing resistance to the passage of the current, and this makes frequent changes of these membranes necessary. The expenses for power, for electrodes and membranes, conjoined with losses of sugar by diffusion, are together such that under existing conditions and present prices of sugar the process is hardly profitable. In the Gin and Leleux modifications of this process lead eclectrodes are used, so that electrode expense is practically nil.

In the opinion of the author, the success of electrodialysis in the sugar industry depends on the discovery of dialyzing membranes capable of long service, not easily subject to damage, and which will not increase the electrical resistance. If insoluble electrodes are to be used some way must be found to neutralize the acids formed in order to avoid inversion of sugar.—J. Berge, in *Sucr. Belge*, Vol. 47 (1927-1928), pp. 283-285, 302-304.)

* * *

Spontaneous Decomposition of Sugar-Cane Molasses.

Periodic analyses of two samples of sugar-cane molasses over a period of fourteen years showed (1) a progressive lowering in the polarization; (2) a constantly increasing loss of sucrose; (3) a slow irregular increase in the percentage of invert sugar for a period of nine years, the amount thereafter beginning to show a slight decrease; (4) a constantly increasing loss in the total sugars after inversion. There was only very slight loss in the total solids of the molasses, the decrease for the ten years, 1917-1927 being 0.67 per cent. and 0.39 per cent. with the two molasses. The pH values of the two samples after 13 years' standing at ordinary temperature were 5.9 and 5.3.

The decomposition of the molasses was attended by a very slight evolution of CO_2 and by the formation of dark coloured organic non-sugars. Bacteriological examination failed to show the presence of micro-organisms. The deterioration is regarded as a very slow spontaneous chemical decomposition of a much retarded "froth fermentation" type. Two theories have been proposed for this type of decomposition: (1) the breaking down of the unstable glucinic acid produced by the action of lime upon reducing sugars, and (2) the decomposing effect of the reaction between amino acids and reducing sugars. While the amino acids no doubt participated in the spontaneous decomposition of the molasses (as shown by the complete disappearance of the amino acid reaction in the deteriorated samples), the small percentage of amino compounds in sugar-cane molasses and the almost exclusive limitation of such alteration to syrups and molasses made by the defection process indicate that the breaking up into acid decomposition products of the unstable compounds formed by the action of lime upon reducing sugars is chiefly responsible for the destructive changes produced.—C. A. Browne (before Division of Agricultural and Food Chemistry, Amer. Chem. Society.)

THE Government has accepted the proposal put forward by the Jamaica Imperial Association for the appointment in the Colony's Department of Agriculture of an Agricultural Chemist whose special duties will be to encourage increased production of various crops by the application of fertilizers to the agricultural needs of the country. —(*Times Trading and Engineering Supplement.*)

The group includes some of the Professors and Students of the Imperial College and of the Staff of the Department of Agriculture, British Guiana.—(*See p.* 209.)

IMPERIAL COLLEGE HOCKEY CLUB, 1927-28

Photograph by *H. O. Thomas.*

Sitting : A. H. Savile, A. K. Briant, J. L. Greig (Captain), H. H. Croucher, O. J. Voelcker.
Standing : C. B. Taylor, J. D. Broatch, J. E. Bruce, G. N. K. Turnbull, A. F. Sheffield, E. B. Martyn—(*See p.* 209).

SPORTS.

Hockey Retrospect, 1927-1928.

THE Hockey Club may regard the 1927-28 season, which has just come to a close, as having been successful. In all, twelve matches were played of which nine were won and three lost, forty-eight goals were hit compared with twenty-one against us. Two defeats were sustained near the beginning of the season when the team consisted of four members who had played hockey before while the remaining seven were enthusiastic beginners. With a little experience the team rapidly got together, settled down and defeated every team in the Colony. The Club was runner up by one point to the Wanderers Hockey Club in the league competition and were knocked out by the Constabulary Hockey Club in the final of the Geddes-Grant Cup by two goals to one.

Taylor as goalkeeper was cool and determined, showing none of the hesitancy of mind so fatal to hockey goalkeepers, while Rounce made a reliable understudy. The full-backs Voelcker and Bruce, as a pair, were sound on a level pitch but were optimistic on a bumpy ground and trusted in the bounce of the ball too much, when they could have made sure with their hands. The half-backs, Croucher, Briant and Sheffield, were all hard workers both in attack and defence, and are deserving of special praise, Briant in particular with his experience of English Hockey was indispensable to the team. The forwards as a whole worked hard and combined well, provided they had room to manoeuvre, but there was always a tendency to get cramped in the circle. Broatch and Martyn, the wing men, both ran and centered well. At centre forward Savile hit some neat goals and was always dangerous in breakaways. Turnbull at inside left was noticeable in tackling back and generally helping the defence though his attack lack thrust.

In conclusion we wish to accord our appreciation of the support given to the Club by Mr. and Mrs. Evans and the College staff who turned out with great regularity to encourage the team in its efforts.

The following played for the College :

Goal.
C. B. Taylor.
Full Backs.
O. J. Voelcker ; J. E. Bruce.
Halves.
H. H. Croucher ; A. K. Briant ; A. W. Sheffield.
Fowards.
J. L. Greig (Capt.) ; G. N. K. Turnbull ;
J. D. Brotach ; E. B. Martyn ; A. H. Savile.

J. L. G.

* * *

Cricket Retrospect, 1927-1928.

THE 1927-28 Cricket season was a fairly successful one. Of the six matches played one was won, three were lost and two were drawn in favour of the College. Individuality of play which characterised past seasons, was entirely absent this year as every member of the XI rose to the occasion at one time or another. Birkett and Bain scored a century respectively, while other useful scores were made by Briant, Nichols, Lewis and Grell. The brunt of the attack was borne by Pieris and Bain, the former's bowling deserves special praise as the average he obtained gives no real indication of his true value to the side. Towards the end of the season, Birkett, owing to pressure of work, tendered his resignation as Captain of the team.

The following is a detailed account of the matches played :

1. College *v.* Mr. F. Austin's XI. Lost by 9 runs. Birkett 75.
2. College *v.* Mr. W. Bushe's XI. Drawn. Bain 113,* Lewis 42.
3. College *v.* Mr. A. Wiles' XI. Lost by 53 runs. Bain 46*.
4. College *v.* Queen's Park C.C. Lost by 42 runs. Pieris 38.
5. College *v.* Leaseholds, Ltd. C.C. Won by an innings, Nichols 52*, Briant 36*.
6. College *v.* Stephens Ltd. C.C. Drawn. Birkett 124.

The following played for the College : Messrs. L. S. Birkett, F. McG. Bain, Capt., C. A. Hyman, A. H. Pieris, A. H. Lewis, J. H. C. Grell, A. F. Nichols, A. F. W. Sheffield, A. C. Palmer, A. L. Grogan, F. E. Buckley, A. K. Briant, C. A. Gomez and R. E. Kelsick.

BATTING AVERAGES.

Name.	*Inns.*	*Total.*	*N.O.*	*H.S.*	*Average.*
L. S. Birkett ..	5	239	0	124	47.80
F. McG. Bain ..	6	184	2	113*	46.00
A. K. Briant ..	4	83	1	36*	27.67
A. F. Nichols ..	6	76	3	52*	25.33

BOWLING ANALYSIS.

Name.	*O.*	*M.*	*R.*	*W.*	*Average.*
F. McG. Bain ..	85	2	326	29	11.24
L. S. Birkett ..	50	11	144	12	12.00
H. A. Pieris ..	78	6	284	19	14.94

F. McG. B.

* Not out.

PHOTOGRAPHS.

1. College Experimental Plots.

ON page x we publish a photograph of some of the College plots which are situated at the back of the Milner Hostel and which are reserved for the use of students to carry out experimental work in connection with their special investigations.

2. British Guiana Expedition.

We are also able to publish on page xi, by the courtesy of the West India Committee, a photograph which represents a party of students and members of the staff during their successful visit to British Guiana, an account of which appeared in a recent issue of *Tropical Agriculture*. The group was taken in the Botanical Gardens, Georgetown, and also includes members of the Department of Agriculture, British Guiana.

THE DUTCH EAST INDIES.

THE total area of the Dutch East Indies which comprise Java and Madura, Sumatra, Borneo, Celebes, part of New Guinea, and the Molucca Archipelago is 733,642 square miles. The chief economic centres are Java and Sumatra, the former as small as England, with 35,000,000 inhabitants, has been well developed, while the latter, which is four times as large, but with only 5,000,000 inhabitants, has only just begun development. The chief sugar-growing district is in the east and centre of Java. The area devoted to the crop increased by 60 per cent. between 1914 and 1923, when the Government intervened by requiring that extra land should be cultivated only by State licence. Sugar exports in 1925 totalled 2,545,000 metric tons; in 1926, 2,514,000 tons, and in 1927, 2,046,000 tons. It is understood that Dutch planters have some form of agreement with Cuba in regard to the restriction of production, but their rapid advance since pre-war years is phenomenal. There are 180 sugar factories with a paid-up capital (mainly Dutch in origin) of 250,000,000 florins. The amount of English capital invested in rubber plantations in the Dutch East Indies is estimated at £15,500,000. The amount of Dutch capital is slightly less and other nations' capital is at least £15,000,000. These figures do not include the capitals of mixed tea and rubber companies which have, within the last few years, started operations in Sumatra. The Dutch Government itself owns seventeen plantations, and the natives are supplying an increasing amount of "wild" rubber. The latter section of supply is undoubtedly affecting the rubber position, as the following figures show:—Native production 1921, 6,000 tons; 1926, 80,000 tons; 1927, 93,000 tons. The total exports of rubber from the Dutch East Indies were 19,226 tons in 1915, 80,000 tons in 1921, 192,000 tons in 1925, 202,000 tons in 1926, 225,000 tons in 1927. Tea was grown in Java before its planting on a commercial scale in India. Java is now producing over 100,000,000 lb. of tea annually, and in this area the planting limit has been reached. Sumatra, on the other hand, only began tea cultivation in 1912, with 1,710 acres devoted to the crop. This area has now increased to over 30,000 acres. In 1917 the crop was less than 5 million lb. This total has now been trebled, but the ultimate production capacity is held to be seven times the present level. The imports of Java and Sumatra tea into this country have increased by 22 million lb. since 1925, and a feature of the tea market last year was the rise in the price of these teas. The Dutch East Indies provide nearly the whole of the world consumption of pepper and quinine, large supplies of copra and some tobacco. The production of palm oil is now 30,000 tons a year, and within ten years it is claimed the output will equal as much as the whole of African production at the present time.—(*The Economist*, Vol. CVI, p. 975.)

COLLEGE NEWS.

Mr. J. H. Aikman, Assistant Accountant, sailed for Canada by the s.s. *Canadian Skirmisher* on 7th July, for three months' leave.

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Mr. Eugene Loumeau, who was Assistant Sugar Technologist during the crop season returned to New York by the s.s. *Western World* on 15th June.

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Mr. A. F. W. Sheffield and Mr. J. F. Williams, both students of the College sailed for British Guiana by the s.s. *Canadian Skirmisher* on 28th June.

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The Principal and Mrs. Evans gave an at home on 24th June, to members of the College Amalgamated Clubs, which was much enjoyed by all who were present.

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Mr. R. Cecil Wood, Professor of Agriculture, has been appointed Acting Principal and Imperial Commissioner of Agriculture for the West Indies during Mr. Evans' absence.

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Mr. H. A. Ballou, Professor of Zoology and Entomology and Commissioner of Agriculture for the West Indies and Mrs. Ballou, sailed for England by the s.s. *Bayano* on 12th June on four months' leave.

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Mr. R. M. Maynard, Empire Cotton Growing Corporation student, sailed by the s.s. *Ariguani* for Jamaica on 1st July. Mr. M. Aspiazu who is a third-year Diploma student and who is returning to Ecuador sailed by the same boat for Cristobal.

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Mr. H. H. Croucher who, in the absence of Professor Hardy, is in charge of the College Department of Chemistry, sailed by the s.s. *Canadian Skirmisher* on 7th July for St. Lucia where he will spend a fortnight investigating soil conditions.

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Amongst recent visitors to the College were Messrs. O. F. Lamartine, E. F. Rocke, A. K. Howell, A. W. Jones, H. Johannen, and B. G. Montserrin who was an ex-student of the College and who is now a member of the staff of the Department of Botany, Toronto University.

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Dr. C. W. Wardlaw, Pathologist to the College Banana Research Station, returned from his visit to St. Lucia by the s.s. *Canadian Volunteer* on 15th June. Working in conjunction with Mr. E. A. Walters, Agricultural Superintendent to the island, he was given facilities to pay visits and make investigations on the derelict banana land of the interior. Dr. Wardlaw sailed by the s.s. *Ariguani* on 1st July for Central America where he will continue his researches during the next two months.

At the last meeting of the Trinidad Science Club which was held on 12th June, Professor H. Clark Powell gave a very interesting address on the citrus industry in Palestine, Cyprus and America, which he illustrated by means of cinematograph films. During his stay in Trinidad Professor Clark Powell spent some time at the College to discuss with members of the staff the possibilities of establishing a citrus industry in the British West Indies. He left for Barbados by the s.s. *Camito* on 26th June.

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The following students accompanied by the Principal and Mrs. Evans, sailed for England by the s.s. *Camito* on 26th June, Messrs. W. Allan, A. G. Bebbington, A. K. Briant, J. D. Broatch, J. E. Bruce, F. E. Buckley, G. Cowan, H. R. Hosking, H. Hutchinson, E. W. Leach, A. H. Lewis, E. B. Martyn, T. H. Nicoll, J. H. Palmer, N. V. Rounce, A. H. Savile, C. L. Skidmore, H. P. Smart, C. B. Taylor, G. N. K. Turnbull and O. J. Voelcker. Messrs. L. S. Birkett, A. L. Grogan, C. A. S. Hyman, A. F. Nichols and A. C. Palmer sailed for Barbados by the same boat.

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Mr. E. E. Cheesman, Professor of Botany and Genetics, sailed for England by the s.s. *Venezuela* on 3rd July, for three months' leave. Mr. W. Scott, Professor of Sugar Technology, sailed by the same boat but will only remain for a short time in England before proceeding to New York where he will represent the College at the meeting of the International Committee of Sugar Technologists. Mr. R. E. Hunter will act for Professor Cheesman and Dr. Hurst will be left in charge of the Sugar Technology Department during Professor Scott's absence.

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A few days before the end of the term, the staff entertained the outgoing students to dinner in the Milner Hostel, and a most enjoyable evening was spent. The dinner was excellent, the flashlight photographer was efficient and the after dinner speeches were what such speeches usually are. Professor Wood proposed the toast of the students, to whom he indicated the advantages of their being at the College while it was in its early stages of development and how their experiences here had served to introduce them to their future careers in the tropics. His reference to overseas hospitality, as exemplified in Trinidad was loudly applauded. Mr. Voelcker on behalf of the students replied in a humorous speech and expressed their appreciation of the situation. Mr. Bebbington proposed the health of the Principal, and in reply Mr. Evans drew from his stock of yarns and tropical experiences. Mr. Corbin replied for the Hostel staff to the vote of thanks proposed by Mr. Smart. Professor Shephard found himself on his feet but was quite equal to the occasion. All arrangements were in the capable hands of Mr. Corbin, the Hostel Manager, and were admirable.

An interesting letter has been received from one of our last year's Post-Graduate students who is stationed in East Africa, and whose present duties comprise the collection of general news about crops in his district and the supervision of Native Council Farms, some of which are situated 200 miles apart. His native instructors are difficult to work with as they are ignorant, unwilling to learn and seldom at their post. The natives' methods of cultivation have in some cases proved efficient, but there is room for improvement. The only tool in use is a " jembe " as ploughs have not yet been introduced. The crops grown are sorgum, millet, beans, ground nuts, maize and rice in the seepage areas. The district is short of rain having dry spells of six months duration and is liable to periods of famine ; the last of which occurred 10 years ago. He has found it extremely difficult to make himself understood, as Kishwahili, the official language, is not universally spoken, and he strongly advises students to break the back of Kishwahili grammar before going out to East Africa. He says that he has walked as many as 28 miles a day when on safari, that he has seen most varieties of big game with the exception of lions which are, however, plentiful, and occasionally intercept his mails. He reports that his training at the College is standing him in good stead although crops are grown under totally different conditions.

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Another interesting letter has been received from a post-graduate student who is now stationed in the most northern part of Nigeria which he describes as a country of sand, bushes and goats ! He is in charge of a 260 acres irrigation farm of which about 70 acres are now under cultivation. As irrigation is expensive only small areas of land can be reclaimed every year, the process of which consists of dividing it into plots, of levelling it and of digging channels to run water over the plots. The water itself comes from a chain of lakes 10-15 miles long and is diverted to the land by means of a series of canals which have been built by an Irrigation Department run by a Native Administration. The chief difficulty is to get rid of surplus water after the rains so that the land may dry out and be tilled and the irrigation water used with effect. The soil is excellent and while crops of rice, dawa and cotton are grown during the rains, wheat, onions, sweet potatoes and maize are cultivated during the dry season. The climate is good. No competent field overseer is available but there are 350 men employed on the farm who spend their time digging and preparing rice land under the magic spell of toms-toms which help them to forget that they are working.

The Editor requests that any subscriber who fails to receive *Tropical Agriculture* regularly should communicate with him immediately in order that the matter may be rectified.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—Recent quotations have ranged as follows. Preferential, *c.i.f.* per cwt., 16*s.* 7½*d.* (1st June), 16*s.* 3*d.* (8th June) 16*s.* (13th June); foreign, *c.i.f.* per cwt., 13*s.* (1st June), 12*s.* 9*d.* (5th June), 12*s.* 3*d.* (14th June). In the report of 14th June, Messrs. C. Czarnikow Ltd., state that markets have been in a depressed condition, interest in Raw Sugars amongst United States and European refiners being almost entirely absent. In the United Kingdom business in raws was only possible at reductions in previous levels. The attitude of the Cuban Defence Commission appears to be a disturbing feature; a decree was signed on 12th June authorizing the transfer to the Cuban Export Corporation of 300,000 tons of the original American quota for sale to countries outside the United States. At present, however, Cuba is in no apparent hurry to dispose of this sugar. Shipments from Java during May were 35,000 tons more than a year ago, and 62,000 tons more than in May, 1926, 48,000 tons being destined for India compared with 19,000 tons last year. Latest cabled quotations (9th July) on the London market are as follows: Foreign 96° *c.i.f.* per cwt., 12*s.* 3*d.*; Preferential, 16*s.*; Yellow Crystals landed duty paid per cwt. 25-27*s.* With regard to grocery grades, with one of the best periods of the year for the consumption of Crystallised and soft West Indian having now been reached, an improvement in the demand for these sugars is certainly due, if not overdue.

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COCOA.—The New York market, which is one of the principal consuming markets in cocoa, is experiencing bad times due to heavy arrivals from Accra where the crop was considered to be at an end. This has meant larger stocks in Licensed Warehouse in New York of approximately 60,000 bags in excess of a year ago. To the end of May the decrease of Accra shipments from 1st October showed 19,000 tons or about 10 per cent. and the feeling is that this will be partly made up during the month of June. Likewise Nigeria to the end of May shows a decrease of only 500 tons less than at the same period last year. On the other hand receipts from Bahia, Sanchez and South America generally are likely to be under what they were a year ago. Statistically, however, the situation warrants steady prices which we think will rule for the balance of the year.—(*By courtesy of the Cocoa Planters' Association, Trinidad.*)

COTTON.—In the first fortnight of June there was a price decline and on 15th June, American Middling was quoted at 11.39*d.* With regard to the new crop everything depends on the weather. The crop is late and this is unfortunate in view of possible boll weevil development. Unless there is hot dry weather over the belt the crop may be very small. The Garside Cotton Service reports that there has been a considerable change over by Continental Spinners from American to Indian Cotton, due to the relatively low price of Indian, and points out that a continuance of this will have a considerable effect next season.

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COFFEE.—Reports for 16th June state that Uganda stood at 85-86*s.* 3*d.* and while this was 3*s.* 9*d.* per cwt. lower than closing May sales, superior grades are firm. Some really fine Costa Rica has made 186*s.* There is a strong market for Brazilian, but prices are not much altered. The reports of the new crop are awaited with much interest. Good ordinary Jamaica is worth about 108*s.* to 110*s.*

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TEA.—The price of Java tea (11.85*d.* av.) favoured buyers. Ceylon at 19.86*d.*; Indian at 16.40*d.* and Sumatra at 13.60*d.* were ordinary quotations. Fine quality is predicted of the new Darjeeling crop as a whole. Chinese new crop tea reports are not very favourable.

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RUBBER.—During the week ending 14th June the market was quiet and, on the whole, steady. Prices declined about ¼*d.* per lb. in the early days of the week but later recovered. The possibility of improved consumption in America is enhanced by the cut in tyre prices, about 15 per cent. While the price of rubber has been halved in the last few months, this is the first substantial reduction in the price of tyres. The American *Questionnaire* shows for the first time a reduction in the percentage of Reclaimed Consumption to Raw from 54 per cent. for the first four months of the year to 51 per cent. for May. Our latest spot quotations for London delivered plantation sheet is 9⅜*d.* per lb. (9th July).

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COPRA.—All forms of coconut are a dull market now, but holders do not press for sales of any description.

ARRANGEMENTS are in progress in Liverpool for the formation of a cocoa exchange to be conducted on the same lines as the Liverpool Cotton Exchange. The Committee comprises representatives of such concerns as the African and Eastern Corporation, the Niger Company, John Holt and Co., and G. B. Ollivant and Co., acting on behalf of shippers, while brokers and dealers are also represented upon it. From statements in the press it would seem that the new movement owes its origin to the widely expressed belief that the London Cocoa Exchange is too much of a close corporation.